SCIENTIFIC RESULTS OF THE *HASSLER* EXPEDITION. BRYOZOA. NO. 1. BARBADOS

JUDITH E. WINSTON[1] AND ROBERT M. WOOLLACOTT[2]

CONTENTS

[1] Virginia Museum of Natural History, 21 Starling Avenue, Martinsville, Virginia 24112.

[2] Museum of Comparative Zoology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts 02138.

ABSTRACT. An unidentified collection of bryozoans made by L. F. Pourtalès and L. Agassiz during the *Hassler* Expedition (1871–1872) was recently discovered in the teaching collection of the Invertebrate Paleontology Department at the Museum of Comparative Zoology, Harvard University. Bryozoan samples found included stations from Barbados to Brazil and around the coast of South America to La Jolla, California.

The first and most successful deepwater collecting of bryozoans was done early in the expedition at two stations (146 m and 183 m) off Barbados, on December 29 and 30, 1871. Thirty-one taxa of bryozoans were collected at the Barbados stations: five cyclostomes and 26 cheilostomes, including one new genus. None of the cyclostomes was reproductive, so taxa could not be identified to species level. Of the 26 cheilostomes, 16 represent new species: *Caberea hassleri*, *Cellaria louisorum*, *Exochella tropica*, *Smittoidea reginae*, *Parasmittina barbadensis*, *Parkermavella salebrosa*, *Hippoporina rutelliformis*, *Metroperiella agassizi*, *Stylopoma haywardi*, *Barbadiopsis trepida*, *Gemelliporina hastata*, *Buffonellaria ensifera*, *Cigclisula gemmea*, *Rhynchozoon sexaspinatum*, *Stephanollona propinqua*, and *Reteporellina directa*. All species found are described and illustrated with scanning electron microscope photographs. Bryozoans of the *Hassler* Expedition are now incorporated into the collections of the Department of Marine Invertebrates of the Museum of Comparative Zoology.

INTRODUCTION

This report concerns a small collection of bryozoans from the island of Barbados located in the Lesser Antilles chain bordering the Caribbean Sea. The specimens were obtained as part of an expedition conducted in 1871–1872 and initiated by Benjamin Peirce, then superintendent of the United States Coast Survey (Anonymous, 1871). Peirce commissioned construction on the Atlantic Coast of the iron-hulled 165-foot steamer *Hassler* for use in hydrographic surveys on the Pacific Coast of North America. The ship, therefore, needed to be moved to San Francisco, the site of its first positioning. Jean Louis Rodolphe Agassiz (founder of the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA) accepted an invitation from Peirce to lead a scientific expedition of Agassiz's design during the ship's circumnavigation of South America from Boston to San Francisco. The ship was staffed with Navy Department personnel headed by Commander P. C. Johnson, but Agassiz was permitted to select nonmilitary scientists and assistants for the expedition (Peirce, 1871). The scientific contingent included Agassiz; Mr. James Blake, assistant and artist; Dr. Thomas Hill, a physicist and former president of Harvard College; Louis Francois de Pourtalès, Esq., scientist in charge of dredging and collecting; Dr. Franz Steindachner, an ichthyologist; and Mr. J. William White, assistant. Agassiz's wife, Elizabeth Cary Agassiz, as well as the wife of Commander P. C. Johnson, also accompanied the expedition (Agassiz, E.C., 1872; Peirce, 1871).

Louis Agassiz had grand visions for the significance of this expedition. In letters soliciting funds for costs of the scientific component of the expedition, Agassiz wrote: " ... the results of this voyage will be as important for the increase of our knowledge of the characteristics of the sea, as the voyages of Capt. Cook were, a century ago, for the improvement of navigation and geography" (Agassiz, L., 1871). Time would

prove, however, that Agassiz's dreams were not realized for the most part.

The voyage began in Boston on 4 December, 1871, and concluded in San Francisco on 30 August 1872. During the course of the cruise numerous stops were made, some planned and some unplanned.

That portion of the expedition relevant to this study concerns circumstances surrounding collections made off Barbados on 29 and 30 December, 1871. Unless noted otherwise, the account given here was taken in large measure from E. C. Agassiz's narrative of the voyage (Agassiz, E. C., 1872) and L. F. de Pourtalès' official summary of the expedition written for the U.S. Coast Survey (Pourtalès, 1875).

The *Hassler* departed St. Thomas on 22 December and headed toward the islands of Santa Cruz, Montserrat, and Guadaloupe to conduct benthic sampling at the deepest depths possible. Heavy seas, however, made such dredging impossible. On 26 December, one of the air chambers of the auxiliary steam pump failed and could not be repaired at sea. The captain elected to head for an unplanned destination, Barbados, where in the city of Bridgetown the engine could be refurbished. They sighted Barbados around 5:00 p.m. that afternoon and anchored later that evening off Bridgetown. Repairs began the following morning and were completed on the afternoon of 29 December. During this interval, Agassiz's group went ashore for touring and collecting.

On the afternoon of 29 December, the *Hassler* steamed 5 or 6 miles up the coast from Bridgetown to Sandy Bay. At this time, measurements of the amounts of light present with varying depth were made by Dr. Hill and a series of dredge hauls were undertaken. The ship returned to Bridgetown that evening, but traveled again the following day back to Sandy Bay for an all-day dredging trip (Blake, 1871–1872). The dredge hauls were wonderfully successful in the eyes of Agassiz. Blake reports "Prof A. said he would be contented if we got nothing else" (Blake, 1871–1872). Especially important finds to Agassiz were specimens of particular sponges, crinoids, echinoids, and an extremely rare living specimen of the gastropod genus *Pleurotomaria* (Malacology Catalogue number MCZ 119057). These hauls also yielded 31 species of bryozoans, which are described for the first time in this report. Sixteen of the 31 are new species, and there is one new genus. The *Hassler* departed its unscheduled detour to Barbados about 5:00 p.m. on 30 December and sailed toward Rio de Janeiro, the next destination on the expedition itinerary.

STUDY AREA AND METHODS

The small (34 km long by 18 km wide) coral–limestone island of Barbados is the easternmost island of the Lesser Antilles volcanic arc, an area extending from the Virgin Islands to Tobago.

The Barbados lots studied here were among the specimens of bryozoans collected during the *Hassler* Expedition (1871–1872). Bryozoan material from the *Hassler* was discovered in the paleontology teaching collection in the Museum of Comparative Zoology (MCZ) in the early 2000s and transferred to the Department of Marine Invertebrates. All of the material was uncatalogued and specimens were unidentified with the exception of a single lot. Remaining bryozoan lots obtained from other locales visited by this expedition will be treated in forthcoming publications.

The Barbados lots were received as several boxes of dry specimens with labels indicating the depth at which they had been collected (80 or 100 fm), but otherwise unsorted except as "Bryozoa". Specimens from each depth were rinsed in freshwater and dried. They were then examined under a dissecting microscope and sorted, or detached from larger substrata when necessary. The processed specimens were given preliminary taxonomic identifications and placed in plastic boxes approved for collections storage. From each sorted lot one or more colonies or colony fragments were selected for study and digital imaging using scanning electron microscopy (SEM). Stan-

dard measurements were made on at least one colony of each taxon found. Measurements were made using a Wild stereomicroscope with 20× oculars (magnification = 100×). The measurements included dimensions of the following characters if present: zooid length (Lz), zooid width (Wz), opesia length (Lop), opesia width (Wop), primary orifice length (Lo), primary orifice width (Wo), orifice diameter (Diam.o) for round orifices, secondary orifice length (Lo2), secondary orifice width (Wo2), ovicell length (Lov), ovicell width (Wov), avicularian length (Lav), avicularian width (Wav).

RESULTS

Species Found

Barbados 80 fm (146 m)
- *Antropora typica*
- *Buffonellaria ensifera*
- *Caberea hassleri*
- *Cellaria louisorum*
- *Crisia* sp.
- *Exochella tropica*
- *Hippoporina rutelliformsis*
- *Metroperiella agassizi*
- *Microporella protea*
- *Patinella* sp.
- *Proboscina robusta*
- *Puellina smitti*
- *Rhynchozoon sexaspinatum*
- *Steginoporella connexa*
- *Stomatopora* sp.
- *Stylopoma haywardi.*
- *Stylopoma smitti*
- *Tervia* sp.
- *Trematooecia turrita*

Barbados, 100 fm (183 m)
- *Barbadiopsis trepida*
- *Bryopesanser pesanseris*
- *Buffonellaria ensifera*
- *Buskea minutiporosa*
- *Cigclisula gemmea*
- *Gemelliporina hastata*
- *Lagenicella verrucosa*
- *Parkermavella salebrosa*
- *Metroperiella agassizi*
- *Microporella protea*
- *Parasmittina barbadensis*
- *Reteporellina directa*
- *Smittoidea reginae*
- *Steginoporella magnilabris*
- *Stephanollona propinqua*
- *Stomatopora* sp.

SYSTEMATICS

Class Stenolaemata
Order Cyclostomata
Family Crisiidae Johnston, 1838
Genus *Crisia* Lamouroux, 1812
Crisia sp.
Figure 1

Description. Colony erect, white, jointed, slightly curving biserial branches (Fig. 1A) and long internodes (12–15 zooids per internode). Zooids long and tubular, their calcified walls sparkling with relatively large, evenly spaced pseudopores. Distal portion of zooid tubes curving slightly up and outward from the branch, orifices round to oval (Fig. 1B). Bases rami, the initiation points of side branches, occur above the third to seventh zooid from the base of an internode. Chitinous joints between internodes black. Tubular attachment kenozooids about 0.9–0.10 mm in diameter grow from the abfrontal side of some of the branches. The colony fragments found did not have gonozooids.

	Measurements		
	Range	Mean	*N*
Lz	0.491–0.819	0.646	6
Wz	0.109–0.127	0.121	6
Lo	0.055–0.073	0.067	6
Wo	0.073–0.082	0.074	6
Wbranch	0.264–0.309	0.281	6

Notes. The morphology and dimensions of zooids and branch internodes are quite similar to those described for *Crisia denticulata* (Lamarck, 1816). However, as Hayward and Ryland (1985, p. 54) point out, "Despite the distinctive appearance of this species, with the jet black joints and wedged-in basis rami being especially clear characters, the name *denticulata* has been widely applied to almost any coarsely

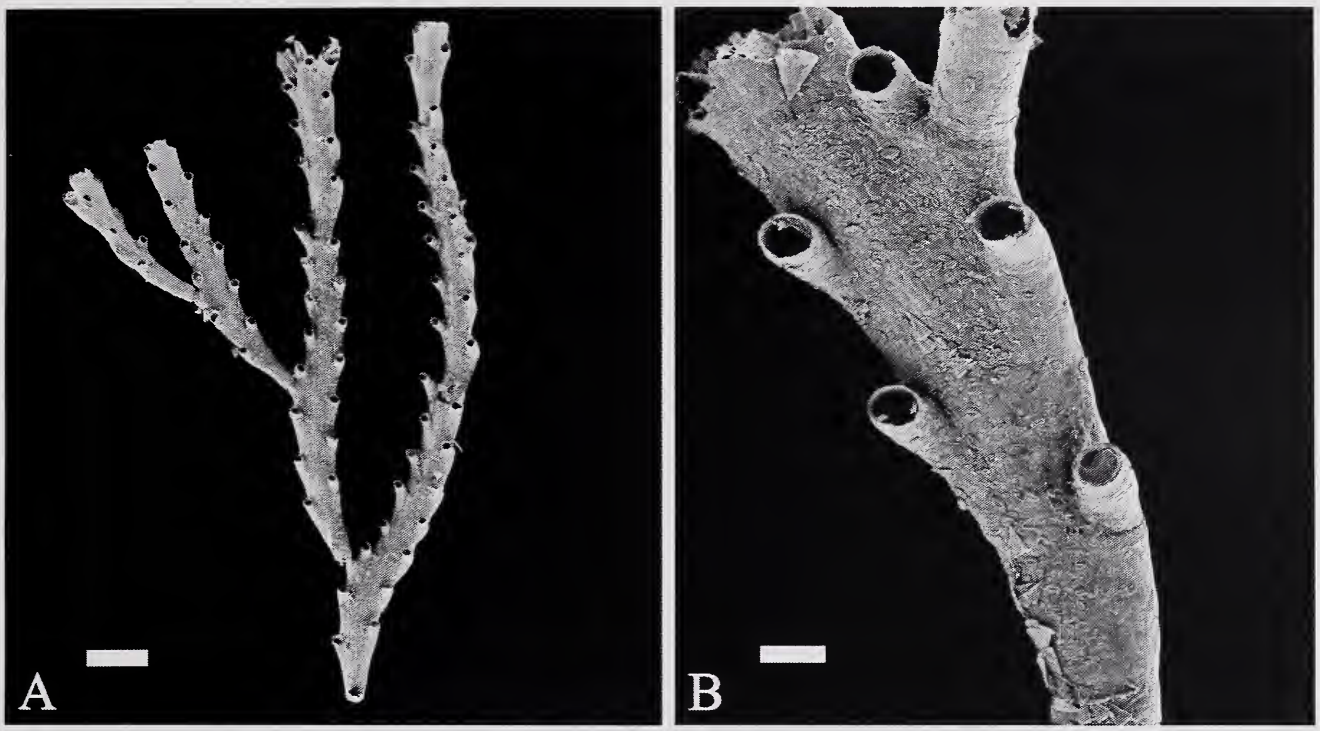

Figure 1. *Crisia* sp. Hassler Box 4. A. Branches of colony. Scale bar = 500 μm. B. Zooids, showing size of tubes and orifice shape. Scale bar = 100 μm. MCZ 100108.

straggling, long internode species, causing confusion on a par with that for *C. eburnea*." The Barbados material is also similar in colony and zooid size, internode length, and dark joint coloration to *Crisia ficulnea* (Buge, 1979) from Brazil. However, since the material examined lacked gonozooids, we identify it here only as *Crisia* sp.

Distribution. Barbados.

Specimens Examined. MCZ 100108. Hassler Box 4, Barbados, 80 fm. December 1871.

Family Oncousoeciidae Canu, 1918
Genus *Stomatopora* Bronn, 1825
Stomatopora sp.
Figures 2, 4D

Description. Colony white, encrusting, uniserial, sparsely dichotomously branching, spreading over and among colonies of bryozoans and other calcareous substrata (Figs. 2 A–D). Zooids narrow, elongate, concentrically wrinkled tubes, impossible to measure more than approximately because of their curvature or their distortion by underlying substratum topography (Fig. 2E). Calcification with transverse striations and numerous small pseudopores that show a sieve platelike ultrastructure when highly magnified (5,000×, Fig. 2F). Orifices small, round, raised slightly in short peristomes from the recumbent portions of zooids. No gonozooids found.

	Measurements		
	Range	Mean	*N*
Lz	0.892–1.183	0.995	3
Wz	0.182–0.200	0.194	3
Diam.o	0.109–0.164	0.133	3

Notes. The *Stomatopora trahens* described by Lagaaij (1963, p. 208) is very similar to the Barbados material in morphology. Only one branching point occurs in the Barbados colony, and it is broken on one side, but the angle of branching is similar, as are the proportions of zooids and orifices. However, it has since been shown (Hayward and Ryland, 1985, p. 60 and Fig. 39B) that *S. trahens* of Couch (1841, p.71) is merely an early growth stage of *Entalophoroecia deflexa* (Couch) 1842. True *Stomatopora* species, mostly from deepwater habitats, have a gonozooid in the form of a small sac budded from the end of the peristome, with a narrow oeciostome projecting from it (Harmelin, 1974, Hayward and Ryland, 1985). The

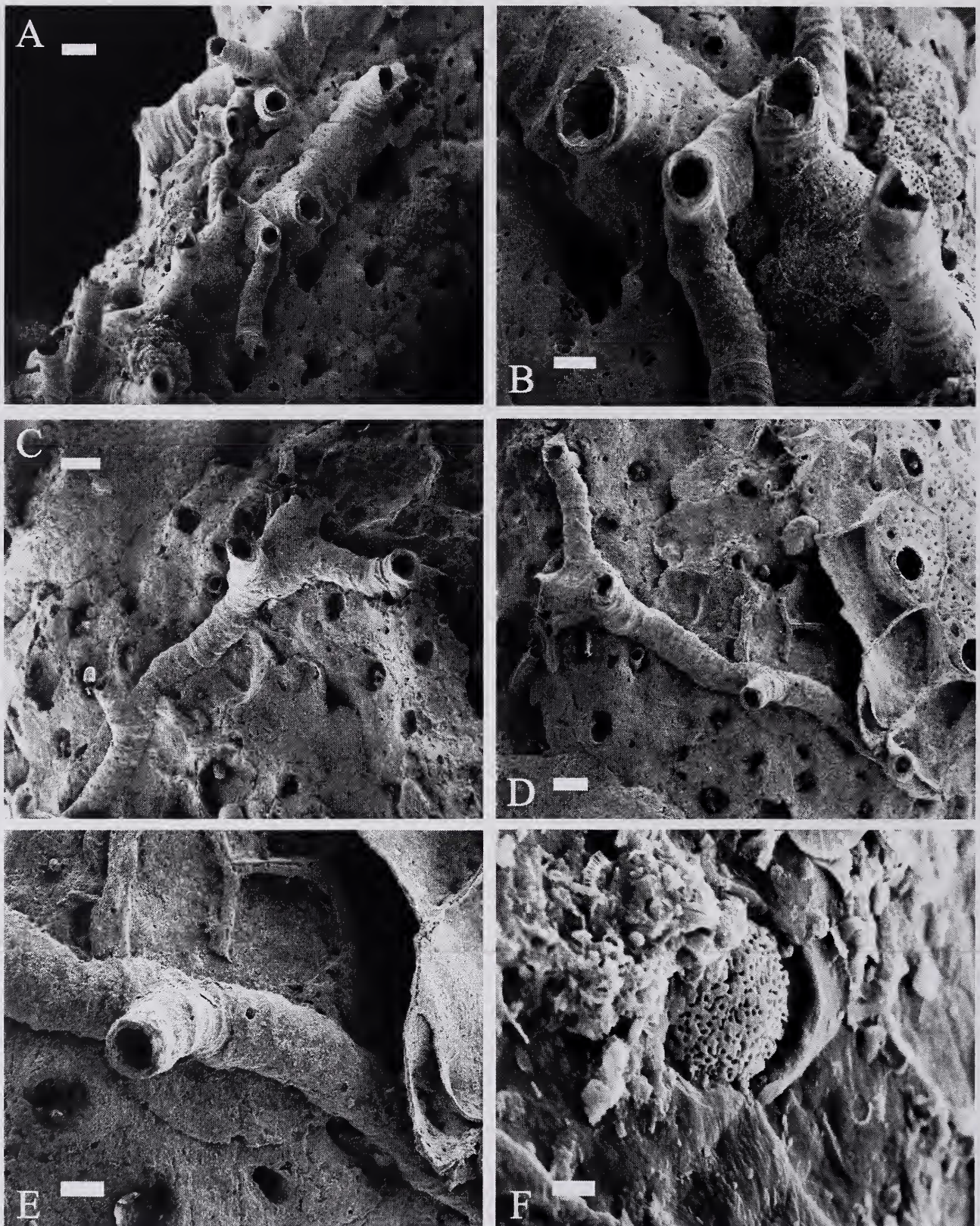

Figure 2. *Stomatopora* sp. (A–E Hassler Box 2. MCZ 100109) A. *Stomatopora* colony creeping over *Proboscina robusta* colony. Scale bar = 200 μm. B. Overlap of the two species. Scale bar = 100 μm. MCZ 100109. C. Another colony, scale bar = 200 μm. D. Partly overgrown colony. Scale bar = 200 μm. E. Close-up of single zooid of *Stomatopora* being overgrown by *Hippoporina rutelliformis*. Scale bar =100 μm. F. (Hassler Box 6. MCZ 100112) Pincushion pore plates. Scale bar = 2 μm.

specimen from Barbados, and Lagaaij's specimen also, have proportionally longer tubes and smaller diameter orifices than seen in the encrusting phases of other erect tubuliporids. They may represent a new species of *Stomatopora*, but lacking gonozooids they cannot be described further.

Distribution. Barbados.

Specimens Examined. MCZ 100109. Hassler Box 2, Barbados, 80 fm. December 1871. MCZ 100110. Hassler Box 6, Barbados, 100 fm. December 1871.

Genus *Proboscina* Audouin, 1826
Proboscina robusta Canu & Bassler, 1928
Figures 3, 4

Proboscina robusta Canu & Bassler, 1928a: 157, pl. 30, fig. 7, 1928b: 100, pl. 9, fig. 4.
Proboscina robusta, Osburn, 1947: 3. Buge, 1979: 219, pl. 2, fig. 2.

Description. Colony white, encrusting, composed of a series of large tubular zooids in biserial to multiserial arrangement (Figs. 3A–C). Zooids adherent to substratum for most of their length, but with distal vertically projecting peristomes, ending in round to oval openings. Calcification heavy relative to some other cyclostomes (e.g., the *Crisia* sp. above), with wrinkled appearance due to numerous transverse striations, and a surface speckled by pseudopores, which at a high magnification (5,000×) show a spokelike arrangement of denticles (Figs. 4B, C). Gonozooids forming in lobate multiserial expansions of the colony, with same pseudopore ultrastructure as autozooid tubes (Figs. 3D–F). Those collected here were found on a very abraded colony, and the oeciostome could not be determined with certainty, but is likely the narrow proximally facing tube showing in Figures 3E and F.

	Measurements		
	Range	Mean	*N*
Lz	0.437–0.801	0.576	6
Wz	0.309–0.382	0.352	6
Diam.o	0.109–0.146	0.129	6

Notes. Both zooid dimensions and pseudopore ultrastructure contrast with those of *Stomatopora* sp. Figure 4D shows portions of adjacent zooid tubes of the two species at 700× for comparison.

Distribution. Caribbean, Brazil.

Specimens Examined. MCZ 100111. Hassler Box 2, Barbados, 80 fm. December 1871. MCZ 100112. Hassler Box 6, Barbados, 100 fm. December 1871.

Family Terviidae Canu & Bassler, 1920
Genus *Tervia* Jullien, 1882
Tervia sp.
Figure 5

Description. Colony white, erect, and dichotomously branching (Fig. 5A). Zooid tubes opening on frontal and frontal-lateral surface, and with an abfrontal surface marked by crescentic transverse striations. Zooids tubular, their boundaries obscured by their curving and transversely striated calcification, but with distal ends raised and curved away from the branch axis as oval to subangular peristomes. Pseudopore ultrastructure consisting of simple angular to rounded openings (Fig. 5D). The colony fragment present in the Barbados material is not complete but shows on its abfrontal surface a swelling (broken off basally) that may be a gonozooid, with a possible oeciostome at its distal end (Figs. 5C–E).

	Measurements		
	Range	Mean	*N*
Lz	0.746–1.056	0.904	6
Wz	0.328–0.382	0.349	6
Lo	0.191–0.246	0.224	6
Wo	0.164–0.182	0.179	6

Notes. SEM images appear flatter than the view of the same specimen through a light microscope. In light microscope view the curving horizontal striations are much more noticeable as is the ridged very three-dimensional shape of the branches. No *Tervia* species have been described from the Western Atlantic–Caribbean region. According to Harmelin (1976) and Hayward and Ryland (1985), the eastern Atlantic species, *Tervia irregularis* (Meneghini) 1844, prefers deep water (100 m+) and detritic deposits of the continental shelves, which agrees well with

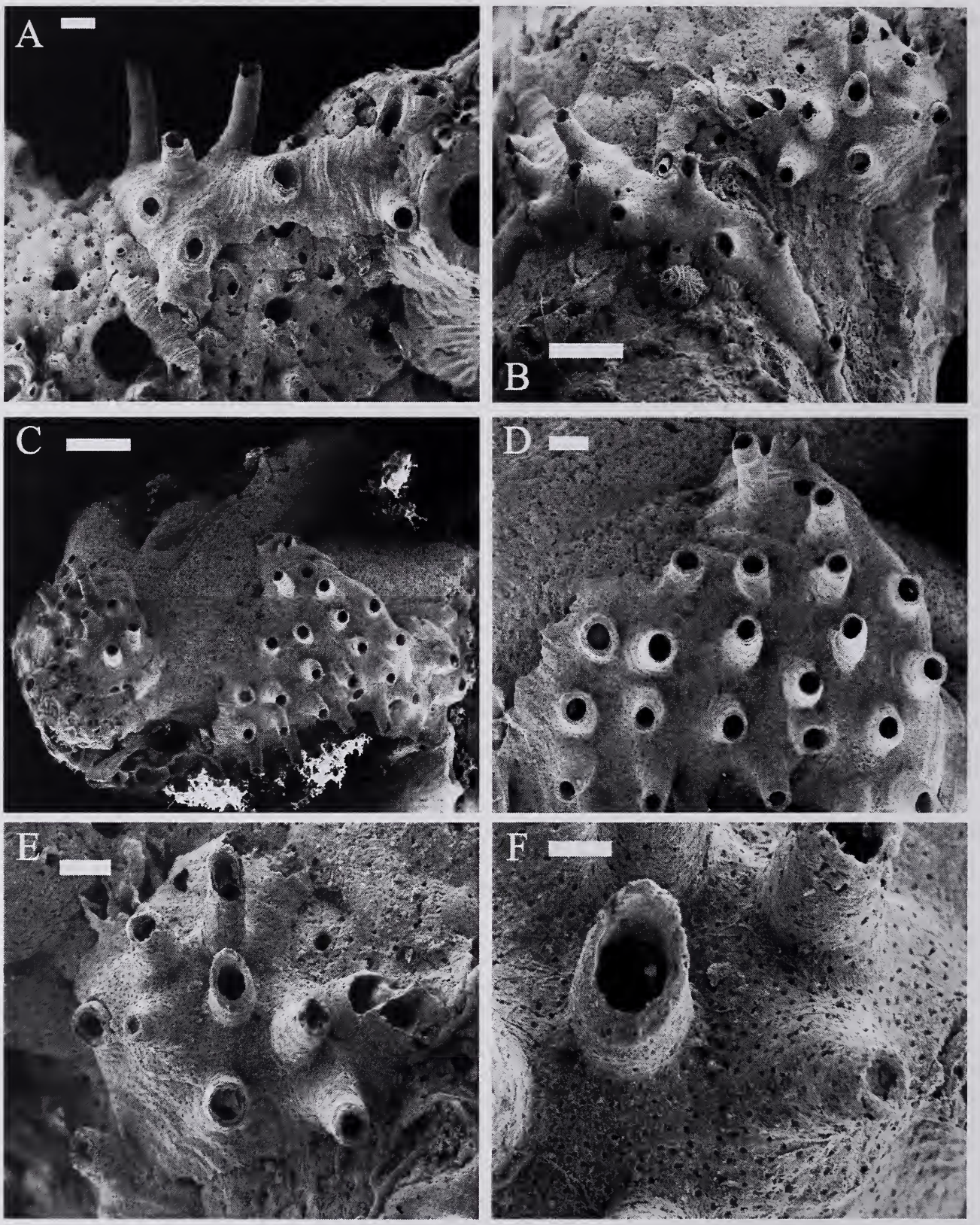

Figure 3. *Proboscina robusta-1.* Hassler Box 6. MCZ 100112. A. Portion of encrusting colony. Scale bar = 200 μm. B. Expansion of zooid rows into lobes. Scale bar = 500 μm. C. View of two lobes of colony. Scale bar = 500 μm. D. Close-up of left lobe. Scale bar = 200 μm. E. Lobe with possible gonozooid. Scale bar = 200 μm. F. Close-up of gonozooid. Scale bar = 50 μm.

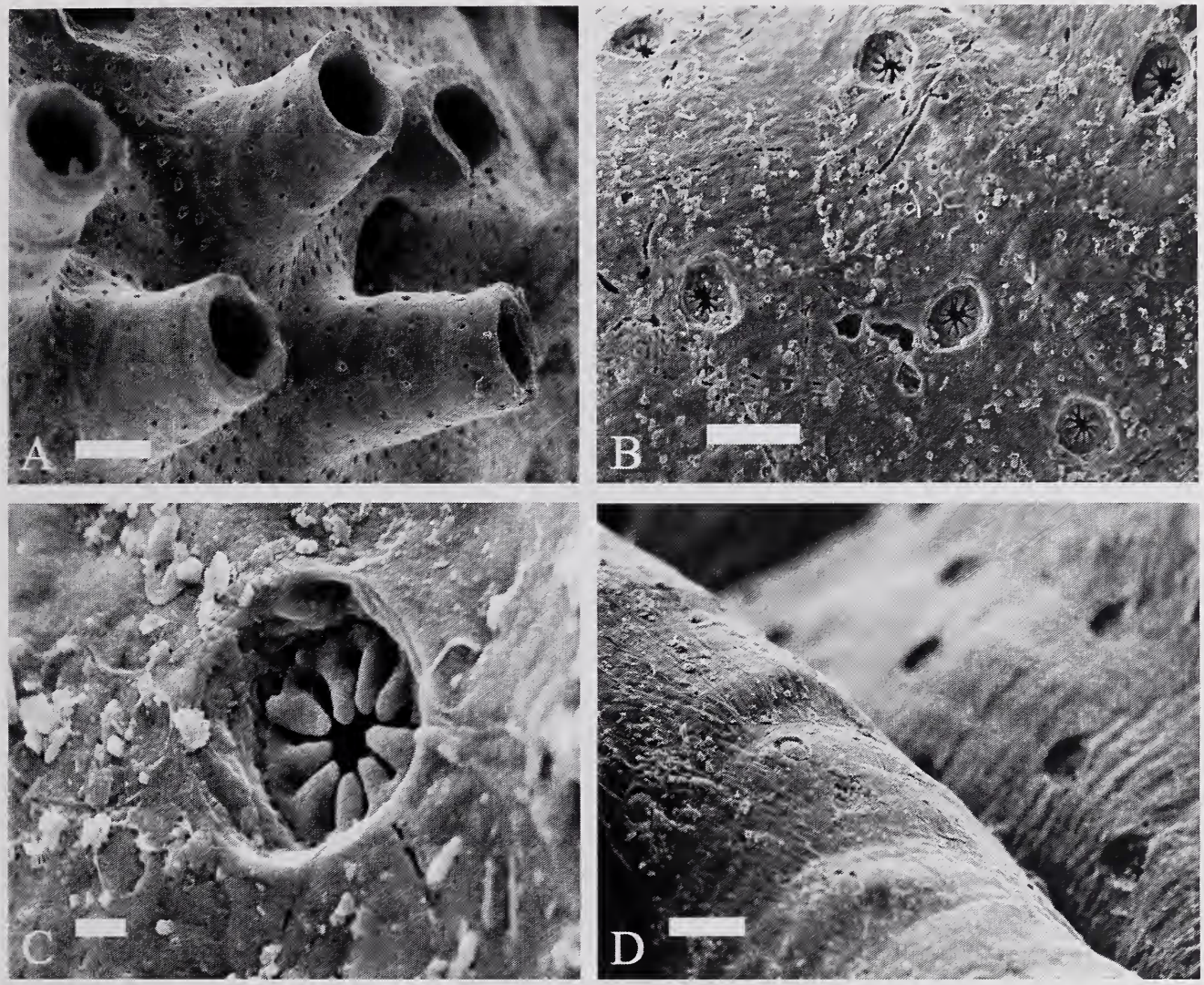

Figure 4. *Proboscina robusta-2*. A. Close-up of pores on zooid peristomes and colony surface. Scale bar = 100 μm. B. Magnified view of pores showing radial denticles. Scale bar = 10 μm. C. Highly magnified pore. Scale bar = 1 μm. D. Direct comparison of pore structure of *Stomatopora* (on left) and *Proboscina* (on right) zooids. Scale bar = 10 μm.

the depth and habitat in which the Barbados specimen was found.

Distribution. Barbados, 100 fm.

Specimens Examined. MCZ 100113. Hassler Box 7, Barbados, 100 fm. December 1871.

Family Lichenoporidae Smitt, 1867
Genus *Patinella* Gray, 1848
Patinella sp.
Figure 6

Description. Colony rounded in outline, the raised central area of spiny zooids interspersed with alveolar spaces is surrounded by a flat peripheral lamina (Figs. 6A, B). Zooid tubes radiating outward from colony center, upper surfaces with knobby keels, their terminal openings with scalloped projections (Fig. 6B). Colony skeleton, including that of the basal lamina, with a pustulose texture due to tiny rounded bumps of calcification (Fig. 6C). No gonozooids present on Barbados specimens.

	Measurements		
	Range	Mean	*N*
Lz	0.291–0.364	0.328	6
Wz	0.109–0.146	0.123	6
Lo	0.073–0.100	0.088	6
Wo	0.055–0.091	0.070	6

Notes. Figure 6A shows what appear to be two subcolonies regenerated from a damaged or senescent older colony. As there are no gonozooids on this composite colony, it is

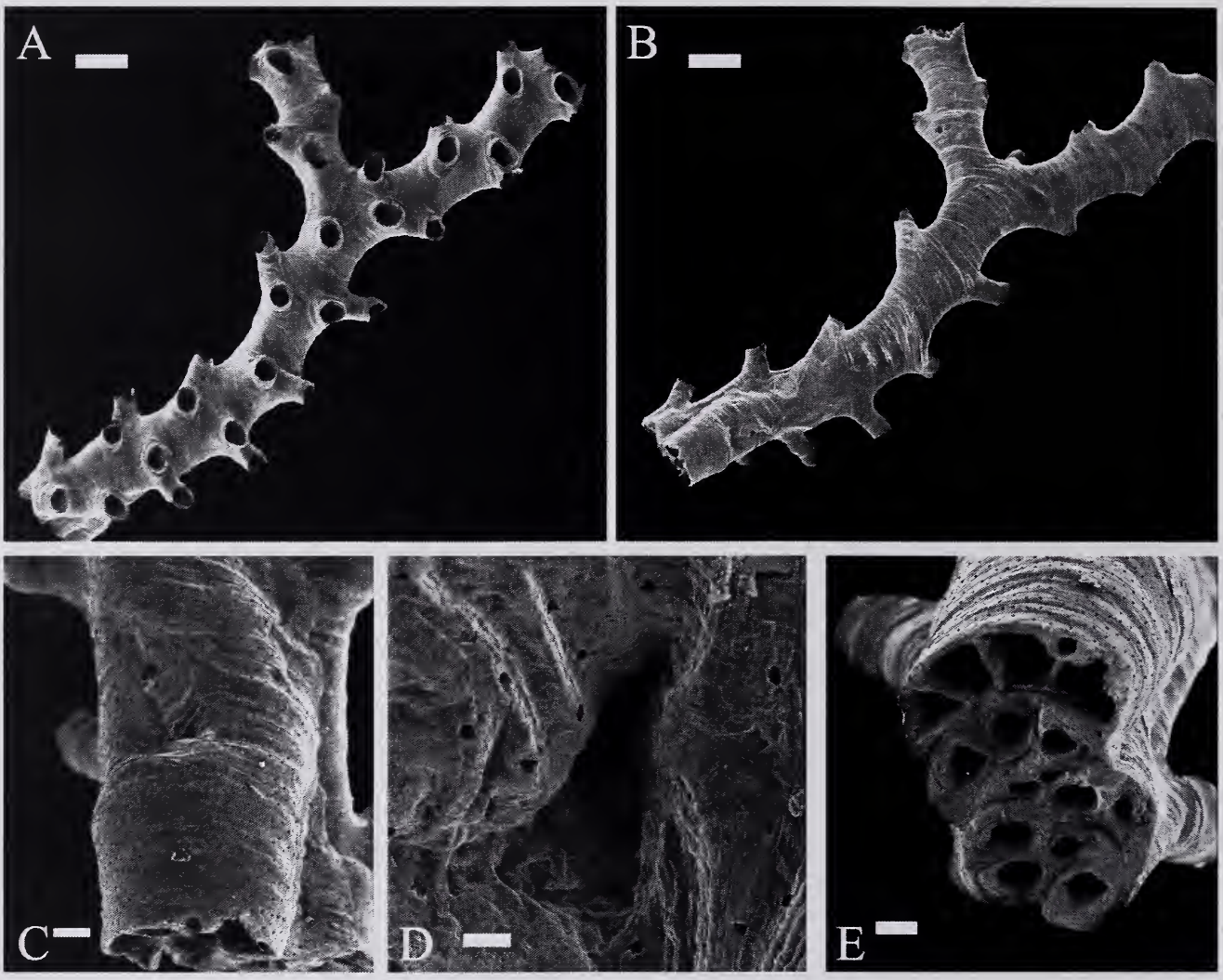

Figure 5. *Tervia* sp. Hassler Box 7. MCZ 100113. A. Frontal view of colony branch. Scale bar = 500 μm. B. Abfrontal surface of same branch. Scale bar = 500 μm. C. Possible gonozooid. Scale bar = 100 μm. D. Opening to possible gonozooid. Scale bar = 20 μm. E. View of broken proximal end of branch. Scale bar = 100 μm.

not possible to identify it further. Its morphology is very similar to the *Patinella* sp. from Smitt's MCZ Florida material, as shown in Figures 348–352 of Winston (2005). But, as with that juvenile colony, there are no gonozooids on which to base a species identification and description.

Specimens Examined. MCZ 100114. Hassler Box 1–2, Barbados, 80 fm. December 1871.

Class Gymnolaemata
Order Cheilostomata
Suborder Neocheilostomina d'Hondt, 1985 (part)
Infraorder Flustrina Smitt, 1868 (part)
Superfamily Calloporoidea Norman, 1903
Family Antroporidae Vigneaux, 1949

Genus *Antropora* Norman, 1903
Antropora typica (Canu & Bassler, 1928)
Figures 7, 8

Membrendoecium strictorostris Canu & Bassler 1928a: 23, pl. 2, fig. 7.
Dacryonella typica Canu & Bassler 1928a: 57, pl. 5. figs. 4–8, pl. 32, figs. 11–12, text-fig. 8a. 1928b: 65, pl. 1, fig. 10.
Antropora typica, Lagaaij, 1963:171, pl.1, fig. 3. Winston 1986: 5, figs. 1–2. Tilbrook, 1998: 37, fig. 3A.

Description. Colony encrusting in one or more layers (Fig. 7A). Zooids with a large irregularly polygonal gymnocyst surrounding a raised subtriangular to pear-shaped cryptocyst with wide striated rows of granular calcification, wide proximally, becoming very narrow at the distal end around the

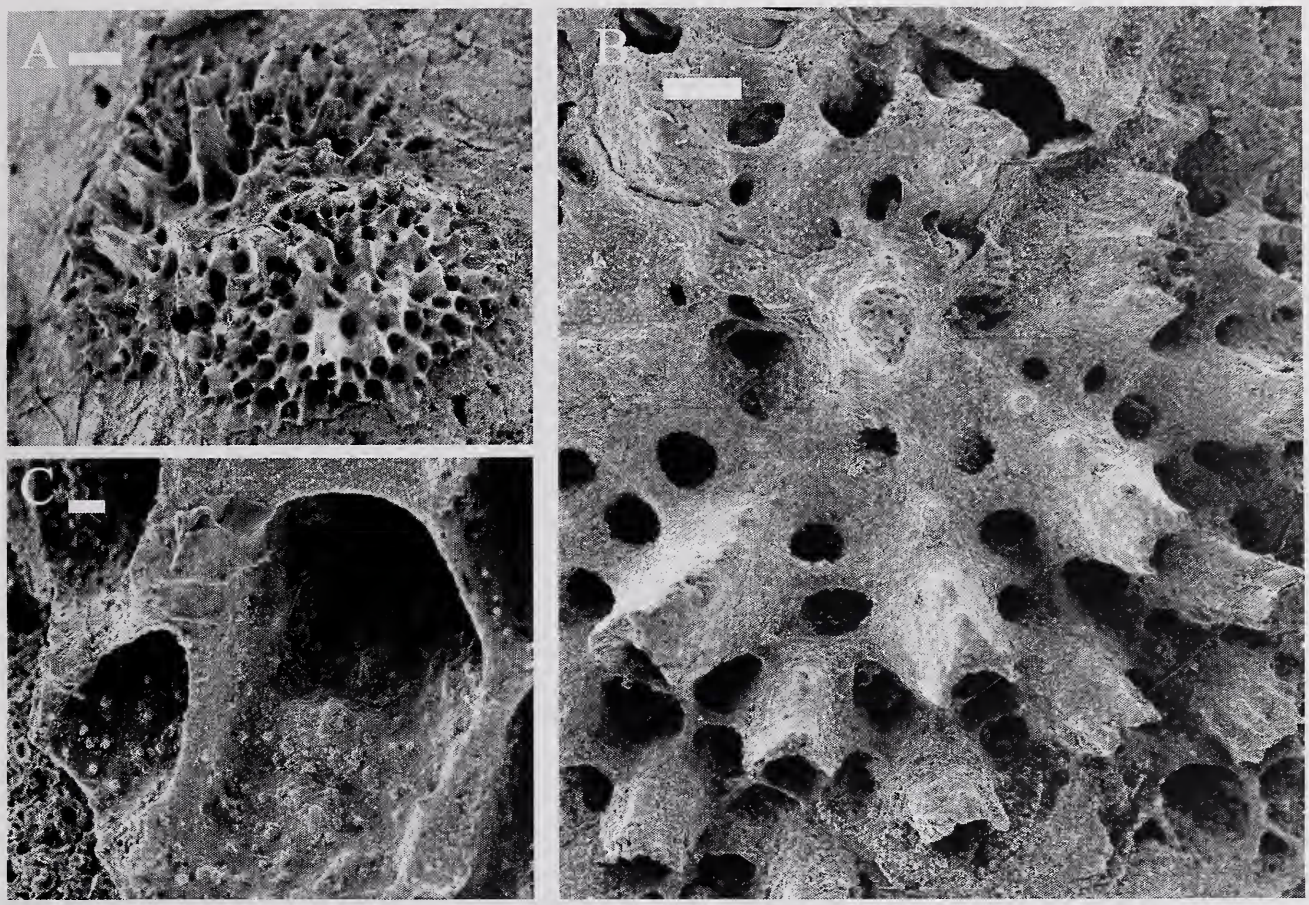

Figure 6. *Patinella* sp. Hassler Box 1. MCZ 100114. A. Entire compound colony. Scale bar = 200 μm. B. Close-up of zooid tubes of smaller subcolony. Scale bar = 100 μm. C. Bumpy surface texture of zooid tubes and peripheral lamina. Scale bar = 10 μm.

operculum (Figs. 7B–D). Small spear-shaped frontal avicularia, oriented in various directions, scattered on frontal gymnocyst walls (Figs. 7C, E). Ovicells endozooidal, marked on the distal rim of the zooid by a thickened bonnet of calcification (Figs. 7C, D).

	Measurements		
	Range	Mean	*N*
Lz	0.382–0.546	0.460	12
Wz	0.309–0.455	0.370	12
Wo	0.055–0.091	0.077	12
Lov	0.055–0.127	0.100	3
Wov	0.164–0.182	0.176	3
Lav	0.082–0.118	0.100	11
Wav	0.036–0.073	0.054	12
Lop	0.182–0.291	0.218	12
Wop	0.127–0.237	0.181	12

Notes. Photomicrographs of National Museum of Natural History (NMNH) type specimens of *Membrendoecium strictorostris* and *Dacryonella typica* of Canu and Bassler (Fig. 8) clearly indicate their similarity in morphology and size. As Canu and Bassler pointed out in the original description of *M. strictorostris*, "The micrometric measurements are quite variable, ranging from one to twice the size and have only an approximate value. The gymnocyst is frequent but in no wise constant.... There are cases of total regeneration" (Canu and Bassler, 1928a, p. 23). In that case, the species name *strictorostris*, by appearing earliest in the publication, has priority. The second reference to the species, as *D. typica,* appears in their Brazil paper, also published in 1928, but much later in the year. Canu and Bassler (1928a) made *D. typica* the Recent type species of *Dacryonella.* The species above is now considered to fall in the genus *Antropora,* of which the accepted genotype is *Antropora granulifera* Hincks, described from the Las Perlas Islands, off the Pacific coast of Panama, and since recorded from other warm-water localities. However, *Antropora typica* has been accepted over *Antropora strictorostris* by later authors,

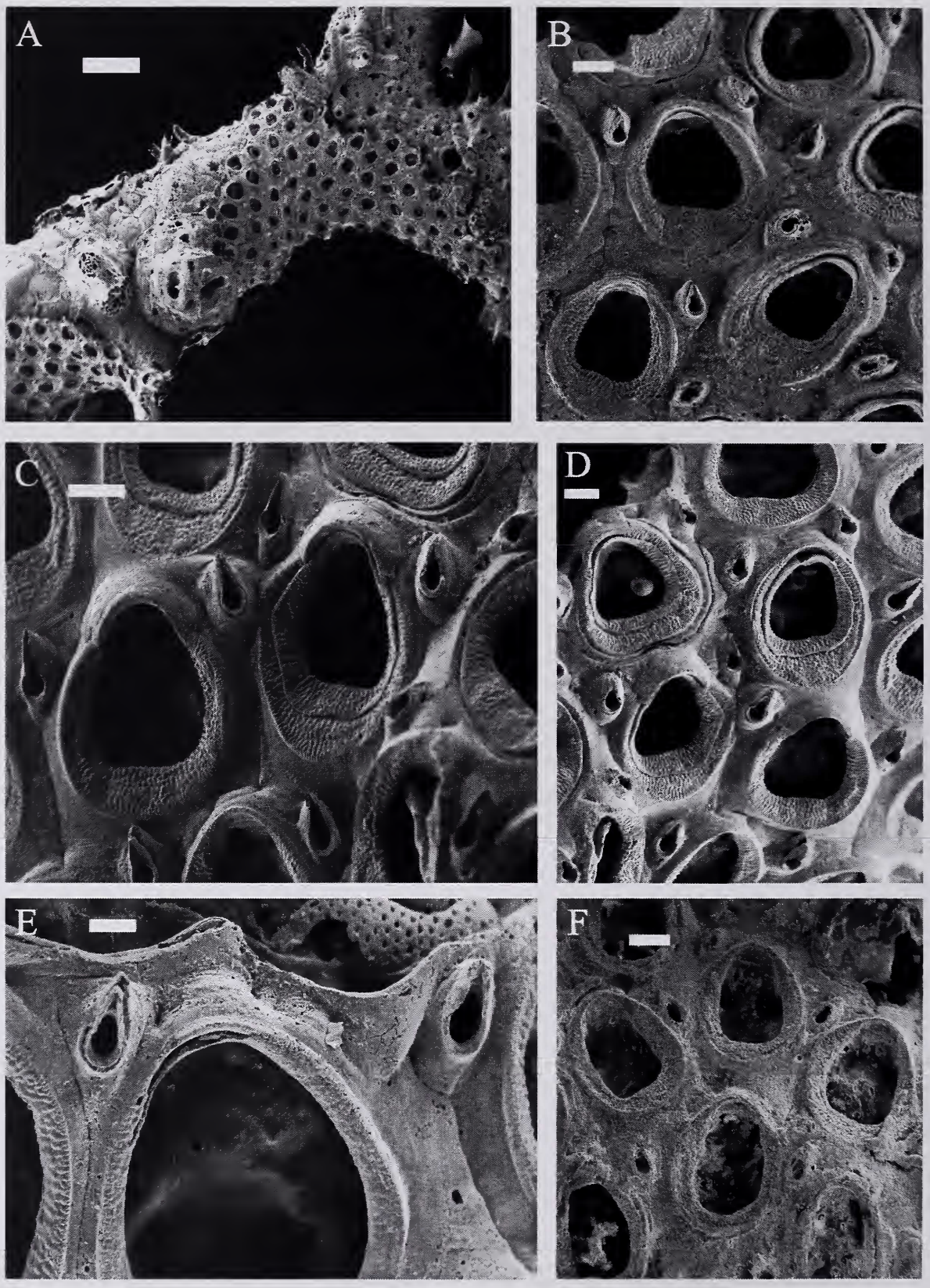

Figure 7. *Antropora typica-1.* (A–E Hassler Box 6. MCZ 10016) A. Entire colony attached to calcarous substratum. Scale bar = 1 mm. B. Group of zooids and avicularia at growing edge of colony. Scale bar = 100 μm. C. Two ovicelled zooids. Scale bar = 100 μm. D. Another group of zooids and avicularia. Scale bar = 100 μm. E. Close-up of two avicularia at growing edge of colony. Scale bar = 50 μm. F. (Hassler Box 2. MCZ 10015) Zooids and avicularia from another colony. Scale bar = 100 μm.

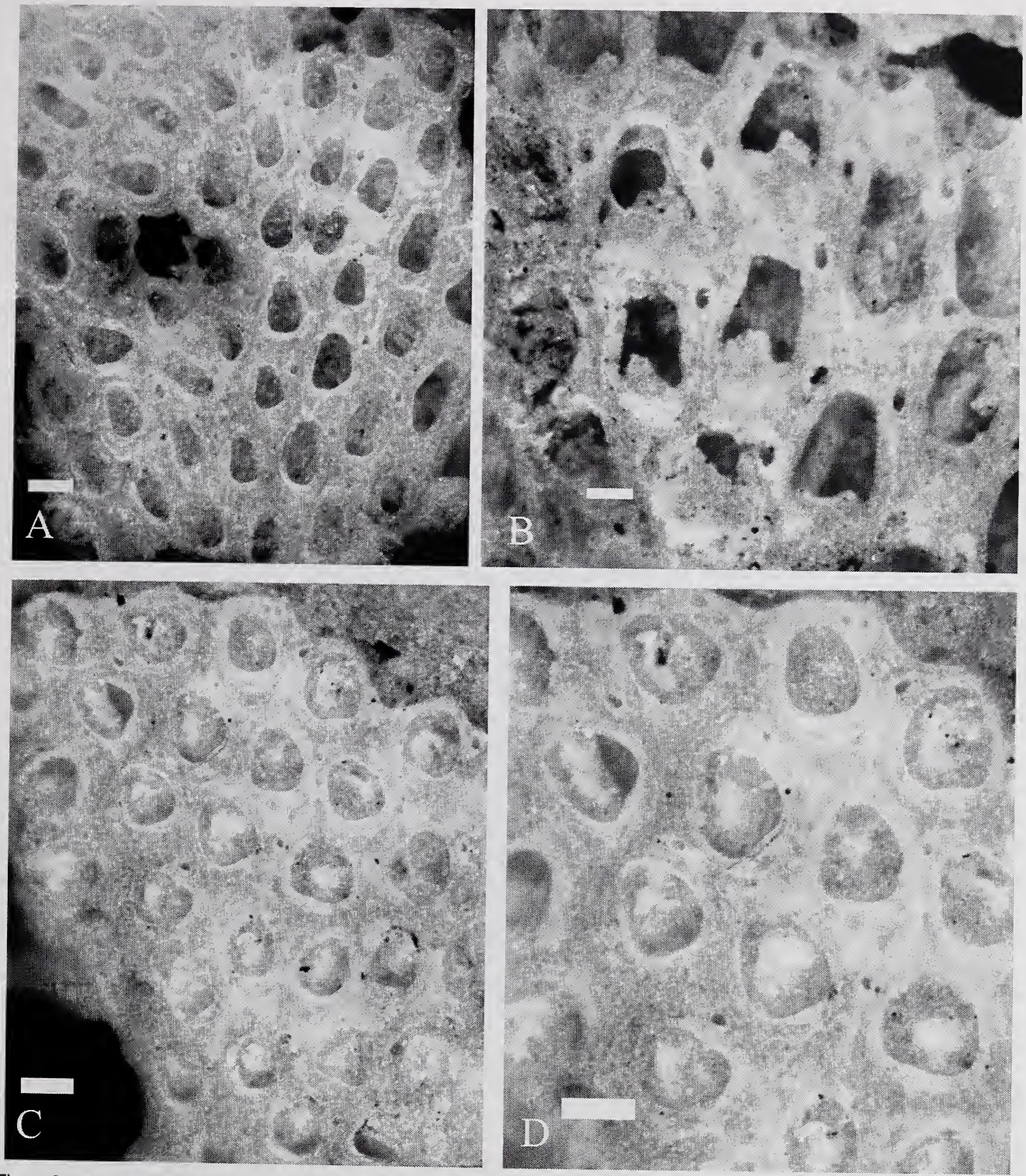

Figure 8. *Antropora typica-2.* Light micrographs of type material of Canu and Bassler. A. *Dacryonella typica* USNM 7484 cotype 1. Scale bar = 200 μm. B. *Dacryonella typica.* Magnified view of zooids and avicularia. USNM 7484 cotype 2. Scale bar = 100 μm. C. *Membrendoecium strictorostris.* Type. USNM no. 7552. Scale bar = 200 μm. D. *Membrendoecium strictorostris.* View of several zooids at higher magnification, same specimen. Scale bar = 200 μm.

not withstanding priority, apparently on the basis of the recommendation of Lagaaij (1963, p. 171), "It would seem appropriate to retain the specific name of the form figured in most detail, which is *typica.*" He based his decision also on the fact that type material of both *M. strictorostris* and *D. typica* were collected at the same *Albatross* station, although *D. typica* specimens are listed from two other localities as well.

Distribution. Western Atlantic: Florida to Brazil, Caribbean, Gulf of Mexico.

Specimens Examined. MCZ 100115. Hassler Box 2, Barbados, 80 fm. December 1871. MCZ 100116. Hassler Box 6, Barbados, 100 fm. December 1871. *Dacryonella typica* USNM 7484 cotype-1 and cotype-2. *Membrendoecium strictorostris*. Type. USNM no. 7552. Both from *Albatross* Station D. 2319, north of Cuba, 23°10′37″N, 82°20′06″W; 143 fm, gray coral.

Superfamily Buguloidea Gray, 1848
Family Candidae d'Orbigny, 1851
Genus *Caberea* Lamouroux, 1816
Caberea hassleri new species
Figures 9, 10

Holotype. MCZ 100117. Hassler Box 5, Barbados, 80 fm. December 1871.

Etymology. Named for the vessel used in the expedition.

Description. Colony tuftlike, erect, and biserially branching (Figs. 9A, B). Frontal surface of branches with two alternating rows of zooids. Color of dried specimen whitish-tan, attached to substratum by rhizoids from the proximal face (Fig. 9C). Zooids short, with an oval frontal membrane that covers most of frontal surface, surrounded by gymnocyst (Fig. 9B). Two or three stout hollow spines with cone-shaped tips on outer distal angle, one spine on inner angle (Fig. 10C). An additional one or two spines visible on zooids at growing tip before development of frontal avicularia covers or replaces them. Only the two proximal spines are visible on ovicelled zooids. Scutum a thick-stemmed and irregular-shaped paddle that covers most of the frontal membrane (Fig. 9E). Orifice semicircular. Raised bluntly triangular avicularia occur on the inner distal margin, mostly small but somewhat variable in size, and sometimes replaced by a giant avicularium with a serrate rostrum (Fig. 9F). Small triangular lateral avicularia also occur. Vibracula long and distally serrated on one side (Figs. 10 A–C). Vibracular chambers are placed on the abfrontal surface, almost covered by attachment radicles, but projecting laterally so that the setal grooves are visible in frontal view. Ovicells subglobular, rounded on their outer edge, pointed distally and on their inner edge, showing inner and outer layers, and a proximal semicircular opening (Figs. 9, 10).

Diagnosis. *Caberea* with large scutum, but with scutum enclosing frontal membrane less tightly than in *Caberea boryi*, the most similar species. Differs from *C. boryi* also in ovicell morphology. The ovicell of *Caberea hassleri* is asymmetrical in shape and flattened, with no foramen, whereas that of *C. boryi* is globular with a central foramen.

	Measurements		
	Range	Mean	*N*
Lz	0.328–0.437	0.379	6
Wz	0.200–0.255	0.228	6
Lo	0.055–0.073	0.065	6
Wo	0.082–0.091	0.089	6
Lov	0.109–0.164	0.140	6
Wov	0.182–0.255	0.221	6
Lav	0.073–0.109	0.088	6
Wav	0.036–0.055	0.046	6
Lop	0.127–0.182	0.158	6
Wop	0.100–0.127	0.115	6
Lo + Lop	0.191–0.255	0.223	6

Notes. *Caberea boryi* has been reported from many widespread localities (Hayward and Ryland, 1998). In the western Atlantic it has been recorded from Cape Hatteras to Florida and the Gulf of Mexico (Lagaaij, 1963; Maturo, 1968), as well as from Brazil. This is the first record of a second *Caberea* species in this region.

Distribution. Barbados.

Specimens Examined. MCZ 100117. Hassler Box 5, Barbados, 80 fm. December 1871.

Superfamily Microporoidea Gray, 1848
Family Steginoporellidae Hincks, 1884
Genus *Steginoporella* Smitt, 1873
Steginoporella magnilabris (Busk, 1854)
Figure 11

Membranipora magnilabris Busk, 1852: vi (explanation of pl. LXV), pl. LXV, fig. 4; 1854: 62 (part), 113.

Steginoporella elegans Smitt, 1873: 15, pl. IV, figs. 96–101; Verrill, 1900: 594. NOT *Eschara elegans* (Milne-Edwards, 1836: 337, pl. 12, fig. 13).

Steganoporella magnilabris Osburn, 1914: 196; 1940: 375, 1947: 18; Canu & Bassler, 1923: 63, pl. 14, figs. 12,

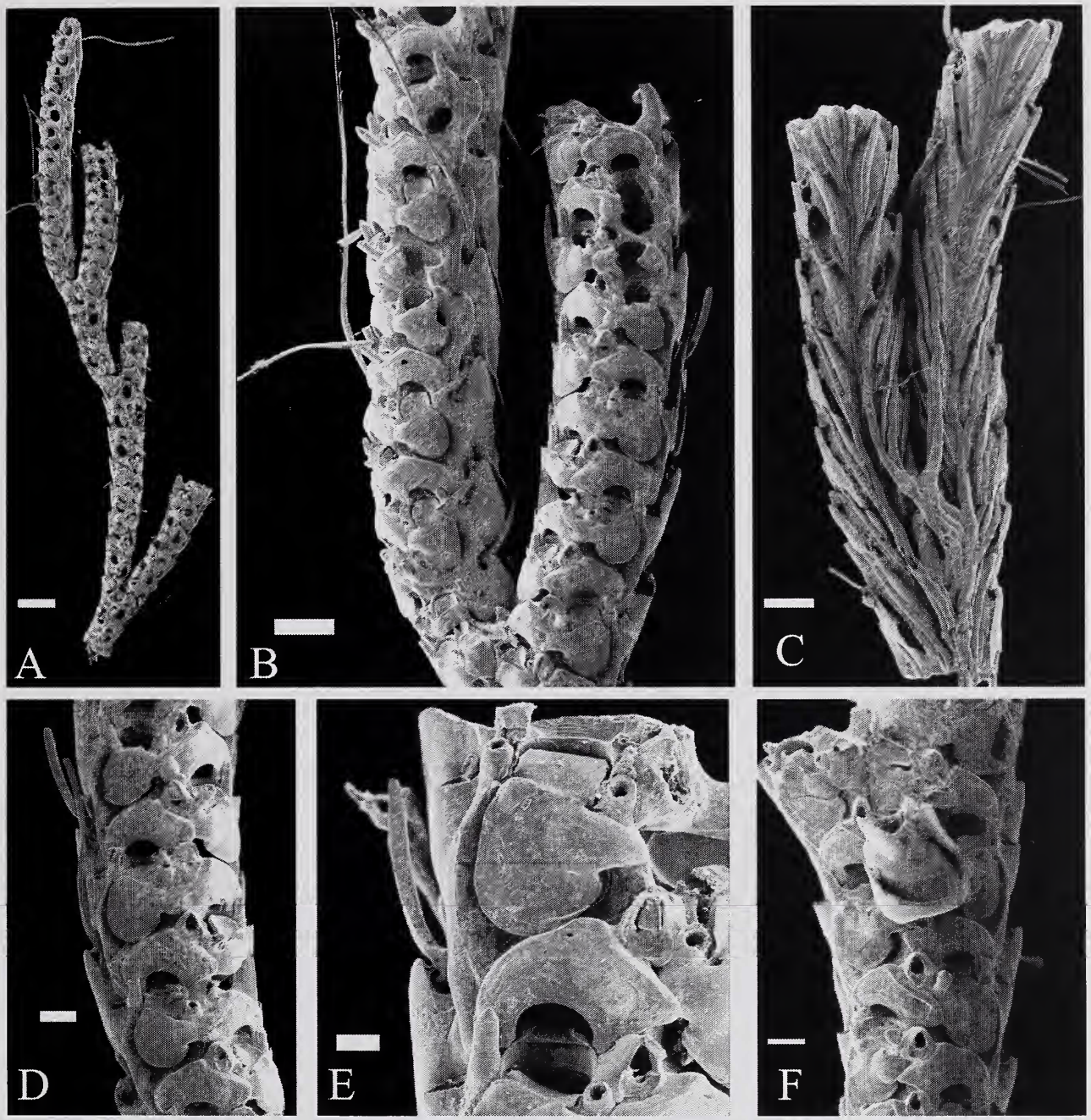

Figure 9. *Caberea hassleri-1.* Hassler Box 5. MCZ 100117. A. Low magnification view of large branch fragment to show branch form and branching pattern. Scale bar = 500 μm. B. Two branches showing morphology of zooids, scuta, and ovicells. Scale bar = 200 μm. C. Abfrontal surface of branch. Scale bar = 250 μm. D. Portion of a branch showing small avicularia and spines. Scale bar = 100 μm. E. Close-up of growing tip of branch. Scale bar = 20 μm. F. Giant avicularium on branch. Scale bar = 100 μm.

13; 1928b: 64, pl. 7, figs. 8–10, pl. 32, fig. 6; Marcus, 1955: 284, Estampa 2, fig. 25; Cook, 1964a: 53, pl. 1, fig. 4, fig. 2; 1968a: 153; 1985: Cook, 1985: 108, pl. 12D; Long & Rucker, 1970: 19, figs. 2, 6; Powell, 1971: 769.

Steginoporella magnilabris Shier, 1964: 618; Pouyet and David, 1979: 784, text-fig. 2, pl. 1, figs. 6,7; Winston, 1984: 10, fig.18.

Description. Colonies encrusting on flat surfaces, or sometimes spreading into tubular to leafy expansions. Colony color pearly pinkish-red to red to red-brown. To the unaided eye the colony has a snakeskin texture due to the large zooids outlined by whitish lateral walls. Zooids dimorphic, mostly of the smaller A-zooid type, interspersed with larger B-zooids. Both forms subrectangular in shape, with raised lateral margins. In the distal portion of the zooids large chitinous opercula are seated upon the horseshoe-shaped shelf formed by curved, sharp-edged distal rim that reaches the curved proximal condyles on

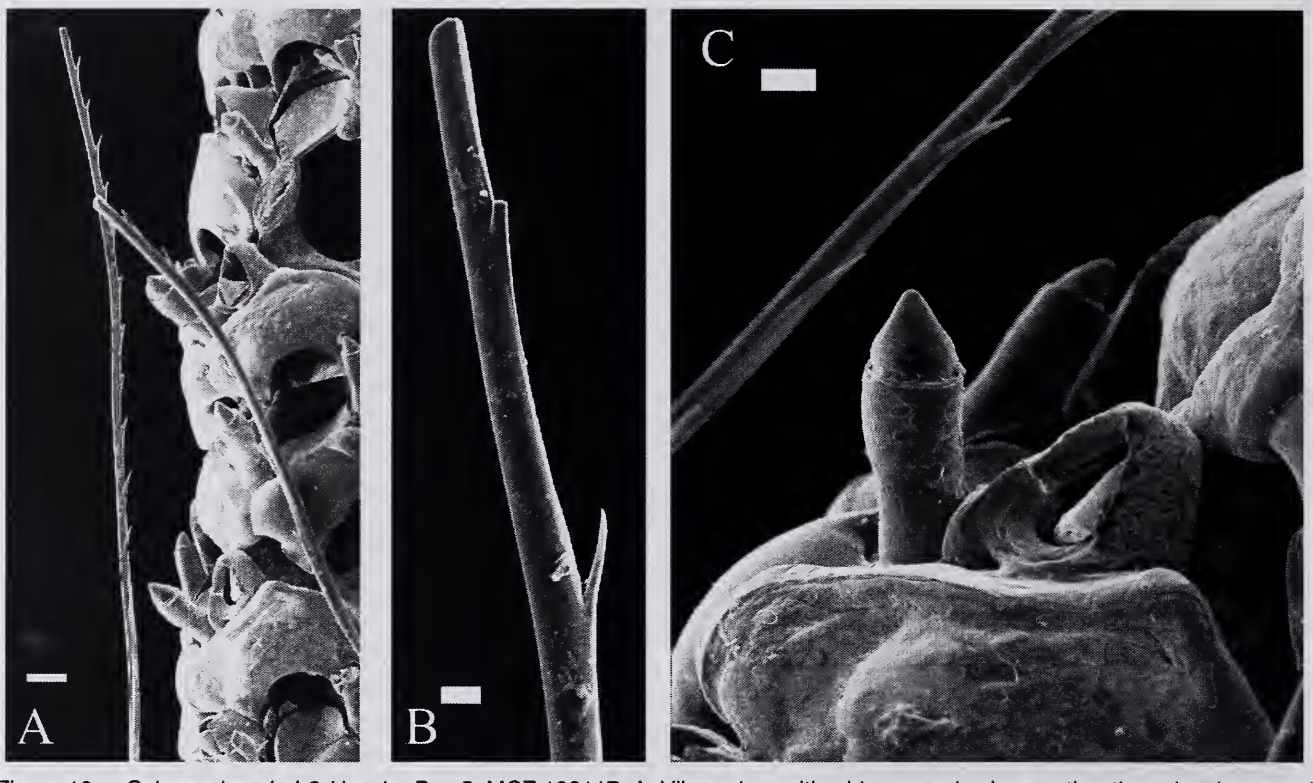

Figure 10. *Caberea hassleri-2.* Hassler Box 5. MCZ 100117. A. Vibraculum with wide-spaced spines, rather than closely spaced serrate ones as in *Caberea boryi.* Scale bar = 50 μm. B. More highly magnified view of spine. Scale bar = 10 μm. C. Close-up of pointed spines and small avicularium. Scale bar = 20 μm.

which they hinge. In the proximal half of the zooid the frontal membrane is underlain by a porous cryptocyst that dips sharply downward from the proximal margin, then rises again to form a sharply inclined tonguelike calcified polypide tube that is separated from the lateral walls by deep notches. In A-zooids the semicircular operculum is reinforced by an inverted U-shaped sclerite and bordered by rakelike chitinous teeth. The larger opercula of B-zooids have an inverted Y-shaped sclerite, bigger marginal teeth, and usually show a crescent-shaped expansion of porous cryptocyst just below the distal rim. No avicularia or ovicells. Embryos brooded in zooids.

	Measurements		
	Range	Mean	*N*
Lz (A)	0.728–1.037	0.901	6
Wz (A)	0.528–0.728	0.628	6
Lop (A)	0.364–0.619	0.443	6
Wop (A)	0.528–0.728	0.628	6
Lz (B)	1.147–1.274	1.210	2
Wz (B)	0.728–0.746	0.737	2

Notes. B-zooids have been considered as precursors to vicarious avicularia. Unlike avicularia, B-zooids have functional polypides that expand to feed along with A-zooids. However, the opercula of B-zooids often open before those of A zooids, their behavior thus more like the mandibles of avicularia. They also appear more responsive than A-zooids to a chemical stimulus, opening to crab juice or amino acid seawater solutions (Winston, 2005).

Distribution. Western Atlantic: Georgia to Brazil, Gulf of Mexico, Caribbean.

Specimens Examined. MCZ 100118. Hassler Box 12, Barbados, 100 fm. December 1871.

Steginoporella connexa Harmer, 1900
Figure 12

Steganoporella connexa Harmer, 1900: 254, pl. 12, fig. 6; pl. 13, fig. 18.
Steginoporella connexa Pouyet and David, 1979: 773, text-fig. 2.
Steginoporella species, Winston, 1984: 10, Figs. 19, 20.

Description. Colony encrusting, sometimes expanding into tubular or platy forms,

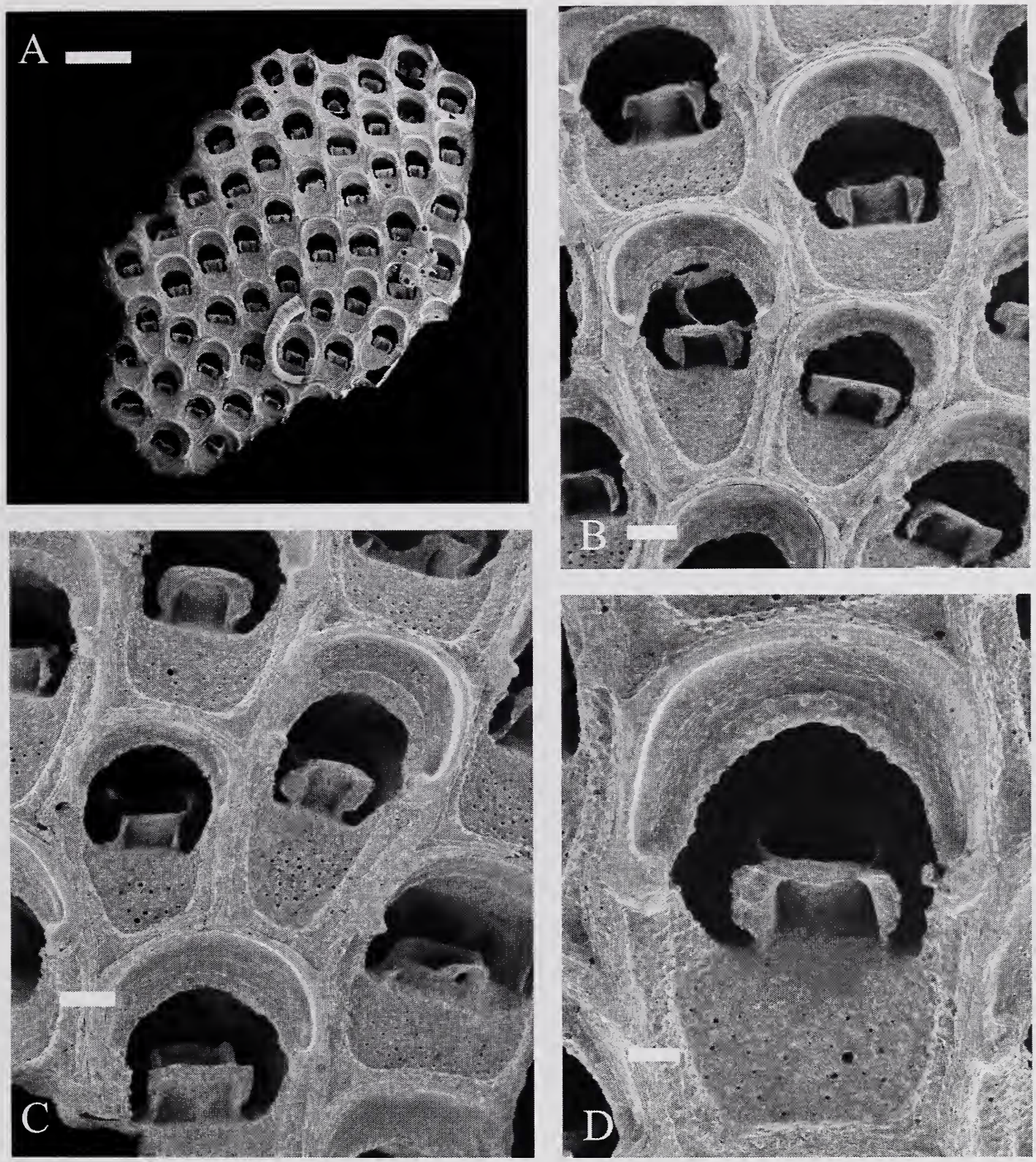

Figure 11. *Steginoporella magnilabris*. Hassler Box 12. MCZ 100118. A. Colony fragment (skeletal). Scale bar = 1 mm. B. Zooids of differing sizes. Scale bar = 200 μm. C. A- and B-zooids. Scale bar = 200 μm. D. Close-up of zooid showing polypide tube. Scale bar = 100 μm.

red to brownish in color when living, with a snakeskin texture similar to that of *S. magnilabris*. Zooids curved distally and rectangular proximally, with a large semicircular orifice, with a heavily calcified rim (Figs. 12A, B). Zooids dimorphic, smaller A-zooids and larger B-zooids. A-zooids have a proximally depressed porous cryptocyst that is perforated by two pairs of opesiules just below the raised proximal rim of the orifice. In A-zooids the orifice takes up the distal third of the zooid (Fig. 12C). In the larger B-zooids the operculum covers about half the zooid, the opesiules may converge as slits, and the narrow distal cryptocyst may be enlarged to support the larger operculum.

The chitinous opercula of both zooid forms are strongly reinforced and rimmed with sharp pointed teeth (Fig. 12 D). No avicularia. No ovicells. Embryos brooded internally.

	Measurements		
	Range	Mean	*N*
Lz	0.928–1.365	1.139	12
Wz	0.601–0.910	0.748	12
Lo	0.309–0.382	0.349	6
Wo	0.455–0.546	0.494	6
Lop	0.364–0.419	0.394	12
Wop	0.455–0.601	0.527	12

Notes. Recent species of *Steginoporella* are found in tropical marine environments, often associated with coral reefs. Paleontologists consider them a good paleoecological indicator for similar environments in the past (Pouyet and David, 1979).

Distribution. Caribbean, Brazil.

Specimens Examined. MCZ 100119. Hassler Box 2, Barbados, 80 fm. December 1871.

Superfamily Cellarioidea Lamouroux, 1821
Family Cellariidae Lamouroux, 1821
Genus *Cellaria* Ellis and Solander, 1786
Cellaria louisorum new species
Figure 13

Holotype. Cellaria louisorum MCZ 100120. Hassler Box 3, Barbados, 80 fm. December 1871.

Etymology. By adding the Latin masculine genitive plural *-orum* to the name Louis.

Named in honor of the two Louis, Louis Agassiz and Louis F. Pourtalès, who collected these specimens on their last expedition together.

Description. Colony consisting of erect, cylindrical, jointed branches (Fig. 13A), developing from a rooted base. Zooids arranged in alternating rows along and around the branches. Zooids broadly hexagonal, distal rims rounded (Figs. 13B, C). Gymnocyst lacking, frontal membranes underlain by a sloping depressed cryptocyst, its calcification pustulose. Opesia reduced to the area just around the operculum. Orifice broadly crescentic, its distal rim beaded, its proximal rim concave, with stout, rounded condyles at each end (Figs. 13C, E). Avicularia vicarious, their hexagonal zooids about equal in size to autozooids, with a round-tipped spear-shaped mandible supported by proximally projecting condyles (Fig. 13D). Ovicelled zooids also similar in size and shape to nonfertile zooids. Ovicells immersed, detectable only by a rounded foramen in the distal cryptocyst, and in some cases (Fig. 13F) by a wider orifice with a concave, rather than convex, proximal rim.

Diagnosis. Differs from the other known Caribbean species of *Cellaria* in the shape of its avicularia, which, though spear-shaped, are broader than those of *Cellaria bassleri*, and in contrast to the semicircular avicularia of *Cellaria mandibulata*. *Cellaria louisorum* also differs from *C. bassleri* in having wider branches, broadly hexagonal vs. rhombic-elliptical zooids, and a round rather than slit-shaped ovicell foramen.

	Measurements		
	Range	Mean	*N*
Lz	0.373–0.455	0.402	6
Wz	0.218–0.273	0.243	6
Lo1	0.055–0.073	0.065	6
Wo1	0.091–0.127	0.108	6
Lav	0.382–0.455	0.411	5
Wav	0.182–0.218	0.204	5
Lo2	0.073–0.082	0.075	5
Wo2	0.100–0.146	0.118	5
Lov2	0.364–0.400	0.379	5
Wov2	0.237–0.273	0.258	5

Notes. Only two living species of *Cellaria* have previously been recorded from the greater Caribbean–Gulf of Mexico region, *C. bassleri* Hastings, 1947, and *C. mandibulata* Hincks (Osburn, 1947). *Cellaria bassleri* was originally described from the Tortugas by Smitt, who identified it wrongly as *Cellaria tenuirostris* from Bass Strait (Winston, 2005). Branches and zooids of *C. bassleri* are narrower, and zooids rhomboidal to elliptical in shape and narrower relative to their length than those of *C. louisorum*. The avicularia of *C. louisorum* are similarly stouter in shape, although both species have avicularia similar in size to autozooids. Ovicells of *C. bassleri* are marked by a slitlike rather than circular foramen. The other species described from the area, *C. mandibulata*, from Aruba (Osburn, 1947), with no illustration, is a

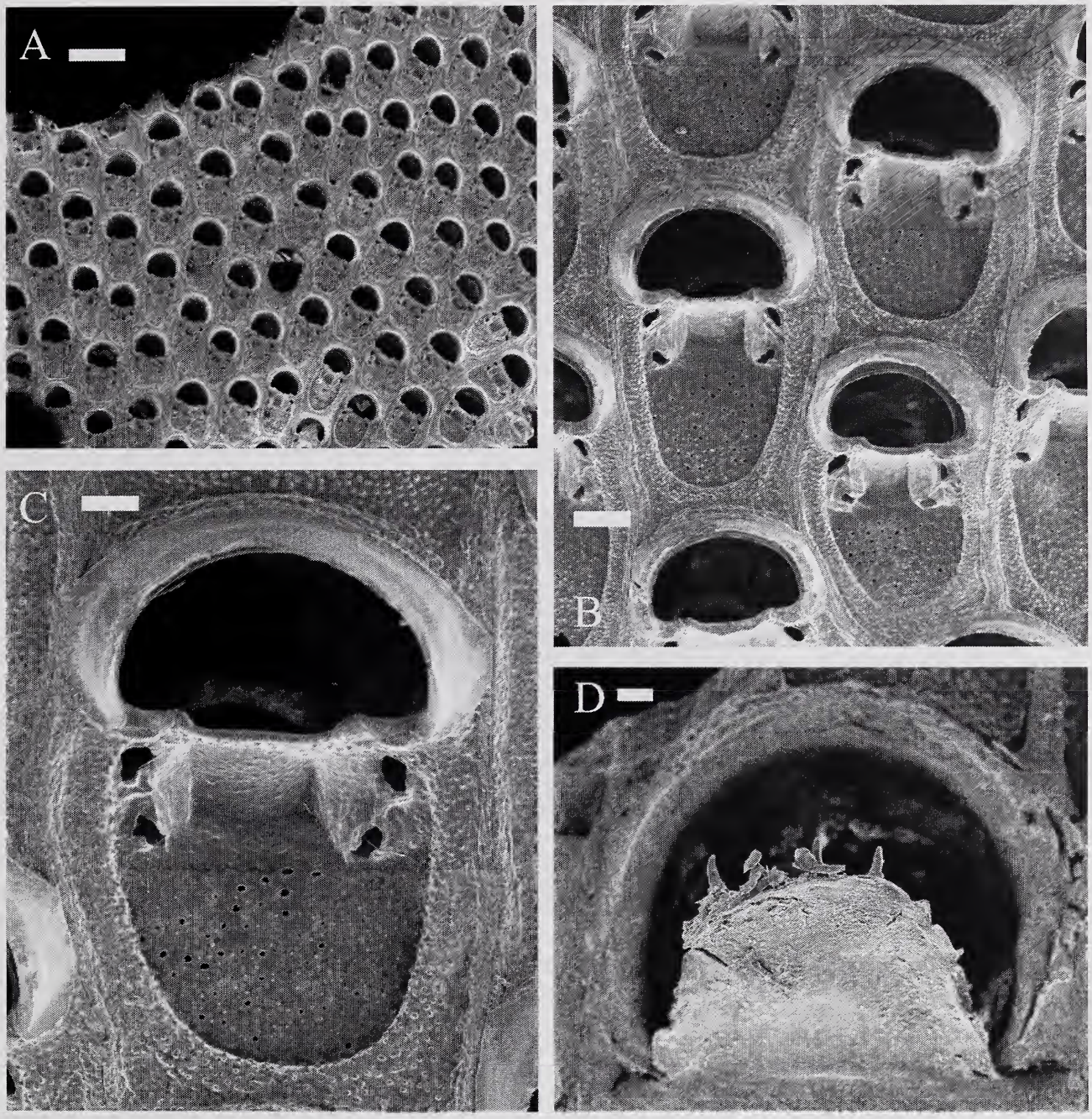

Figure 12. *Steginoporella connexa*. Hassler Box 1-2. MCZ 100119. A. Portion of colony. Scale bar = 1 mm. B. Group of skeletal (bleached) A-zooids. Scale bar = 200 μm. C. Close-up of one A-zooid. Scale bar = 100 μm. D. Unbleached area, showing an A-zooid operculum. Scale bar = 50 μm.

species with avicularia with semicircular rather than spear-shaped mandibles.

Distribution. Barbados.

Specimens Examined. MCZ 100120. Hassler Box 3, Barbados, 80 fm. December 1871.

Infraorder Ascophora Levinsen, 1909
"Grade" Acanthostega Levinsen, 1902
Superfamily Cribrilinoidea Hincks, 1879
Family Cribrilinidae Hincks, 1879
Genus *Puellina* Jullien, 1886
Puellina smitti Winston, 2005
Figure 14

Cribrilina radiata Smitt, 1873: 22. In part. NOT *Eschara radiata* Moll, 1803: 63, pl. 4, Fig. 17a–i.

Cribrilaria flabellifera Banta & Carson, 1977: 392, fig. 4.4; Winston, 1984: 13, figs. 25–27. Not *Cribrilina radiata* var. *flabellifera* Kirkpatrick, 1888: 75. pl.10, fig. 4.

Puellina smitti Winston, 2005: 34, Figs. 89–93.

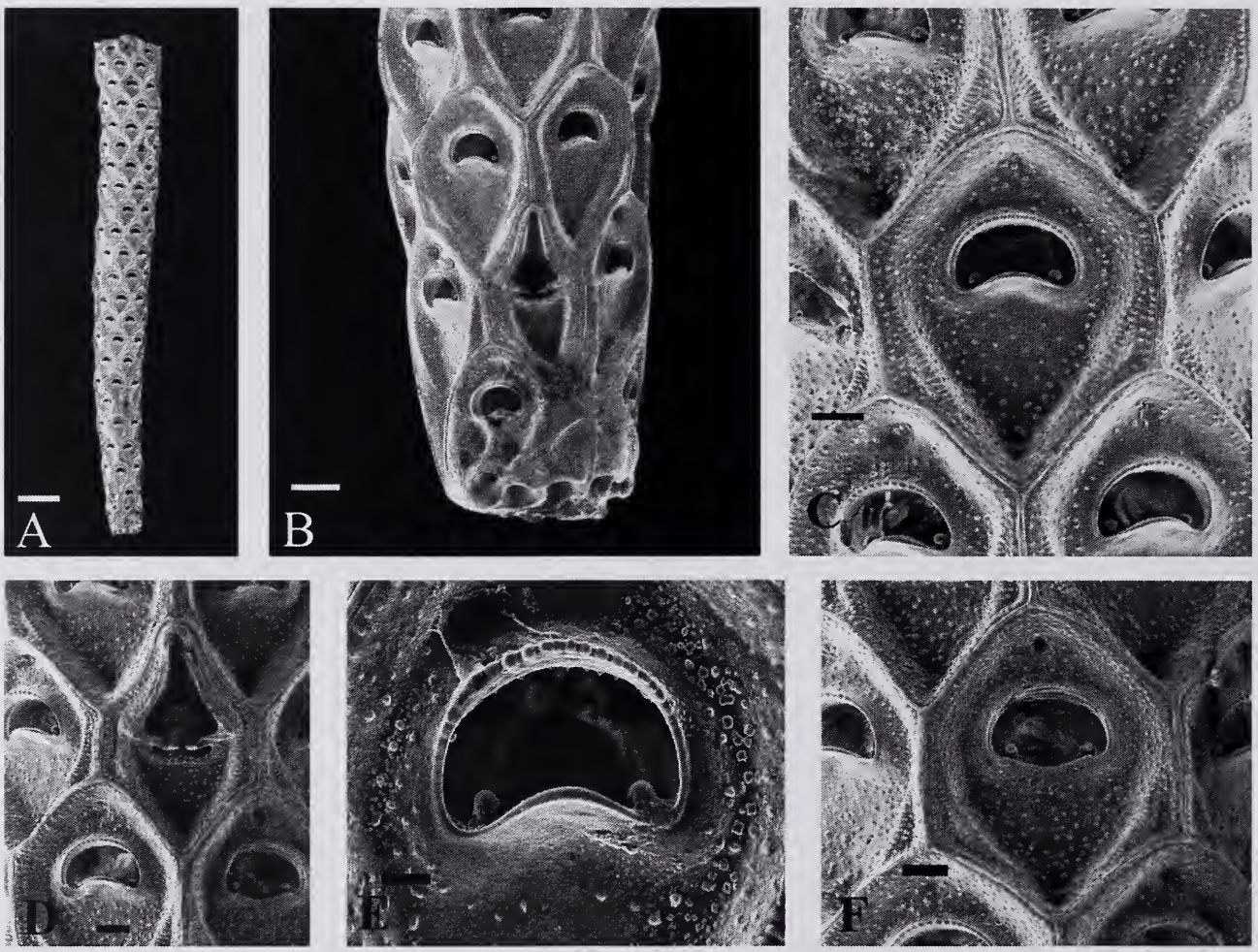

Figure 13. *Cellaria louisorum.* Hassler Box 3. MCZ 100120. A. One branch internode. Scale bar = 500 μm. B. Close-up of proximal end of internode showing avicularium and zooids. Scale bar = 100 μm. C. An autozooid. Scale bar = 100 μm. D. Close-up of an avicularium. Scale bar = 50 μm. E. Close-up of orifice, showing beaded distal rim, curved proximal rim, and rounded condyles. Scale bar = 20 μm. F. Fertile zooid, showing ovicell foramen and wider orifice. Scale bar = 50 μm.

Description. Colony encrusting and small in size, often heavily fouled or partly overgrown (Fig. 14A). Zooids small, more or less oval in shape. Frontal walls composed of five to eight pairs of well-defined, rounded, radiating costae, separated by evenly spaced pores. The first set of costae is sometimes thicker than the following costae and may show a bifid median umbo (Fig. 14C). Orifice semicircular with six hollow spines surrounding its distal and lateral rim (Fig. 14D). Avicularia with oval zooids covered by smooth calcification, a flaring calcified rostrum, and a subtriangular, paddle-shaped mandible, are found between zooids, especially at growing edges of colonies. Ovicells imperforate, helmet-shaped, with a central-frontal thickening.

	Measurements		
	Range	Mean	*N*
Lz	0.328–0.437	0.379	12
Wz	0.218–0.328	0.268	12
Lo	0.046–0.073	0.057	11
Wo	0.055–0.091	0.077	12
Lov	0.164–0.182	0.170	3
Wov	0.146–0.146	0.146	3
Lav	0.200–0.273	0.228	12
Wav	0.109–0.200	0.135	12

Notes. Despite abrasion and fouling of the fragmentary Hassler Barbados specimens, their distinguishing specific characters are clear. So far six *Puellina* species have been described from the tropical Western Atlantic, all distinguishable by a combination of size (zooid length) and other characters. *Puellina smitti* is the only one of them with flabellate avicularia. The only other species with six oral spines, *Puellina parva* Winston and Håkans-

son, 1986, is very small (mean zooid length = 0.232 mm) and has no avicularia. The other species lacking avicularia, *Puellina capronensis* Winston, 2005, has a mean zooid length of 0.316 mm, five oral spines, and a pronounced, raised first pair of costae. The largest species, *Puellina saginata* Winston, 2005, is 0.73 mm in length, and has an expanded gymnocystal area, no suboral lacuna, pointed avicularia, and five pairs of spines, whereas the other species with five oral spines, *Puellina testudinea* Winston, 2005, is considerably smaller (mean zooid length, 0.500 mm) and has a suboral lacuna. Additional *Puellina* species are likely to be found in the tropical western Atlantic region. Despite their inconspicuous and probably ephemeral nature, they are often common on calcareous substrata and seem to be pioneers of newly available substrata, from dead shell or coral to fouling panels.

Distribution. Florida Atlantic coast, Caribbean.

Specimens Examined. MCZ 100121. Hassler Box 2 (with *Metroperiella*), Barbados, 80 fm. December 1871. MCZ 100122. Hassler Box 6 (with *Antropora*), Barbados, 100 fm. December 1871.

"Grade" Umbonulomorpha Gordon, 1989
Superfamily Lepralielloidea Vigneaux, 1949
Family Romancheinidae Jullien, 1888
Genus *Exochella* Jullien, 1888
Exochella tropica new species
Figure 15

Exochella longirostris, Lagaaij, 1963:194, pl. 5, fig. 5. [USNM648040]

Holotype. MCZ 100123. *Exochella tropica*. Hassler Box 1-2, Barbados, 80 fm. December 1871.

Etymology. Named for its preference for warm seas in contrast to the cold water preference of other members of the genus.

Description. Colony white, encrusting, rough-textured in appearance due to its heavily calcified ribbed zooids and projecting avicularia (Fig. 15A). Zooids oval to rhombic in shape. Frontal wall calcification imperforate except for large marginal pores located between lateral ribs of calcification that extend and become flattened toward the midpoint of the convex zooids (Figs. 15C and D). Primary orifice hoof-shaped, rounded distally, and shallowly convex proximally (Fig. 15E). Four hollow spines occur at the distal end of the orifice (Figs. 15E and F). As zooids age, the central proximal margin of the orifice is obscured by a projecting bifid lyrula (Fig. 15F) that develops into a large proximal mucro. Lateral processes developing from the sides of the orifice curve and may join, forming two rings on each side of the central projection. As zooids undergo secondary calcification, a thick tubercle may also develop below the peristome. Single or paired avicularia are located in the proximal third of zooid lateral walls, oriented laterally to slightly distolaterally. They have crossbars and narrowly triangular rostra, raised at an angle from the downsloping zooid margins. No ovicells were present on the material collected.

Diagnosis. *Exochella* species having four oral spines (visible only early in astogeny, Figs. 15E, F), a hoof-shaped primary orifice, strongly marked marginal pores and ribs, and single or paired avicularia placed below the midpoint on lateral walls and oriented laterally to slightly distolaterally. *Exochella tropica* differs from *E. longirostris* Jullien (1888) in the shape of the primary orifice, the number of oral spines (three for *E. longirostris*), and the position of the avicularia (at the midpoint of the lateral wall and laterally oriented), and by its ribbed rather than granular calcification.

	Measurements		
	Range	Mean	*N*
Lz	0.455–0.546	0.494	6
Wz	0.218–0.309	0.261	6
Lo	0.064–0.082	0.073	6
Wo	0.109–0.137	0.126	6
Lav	0.127–0.218	0.170	6
Wav	0.055–0.109	0.076	6
Avic distance from zooid distal end	0.255–0.309	0.273	6

Notes. According to Hayward (1995), *E. longirostris* is a magellanic species with a range extending from southern Chile to the Falkland Islands. The genus *Exochella* itself

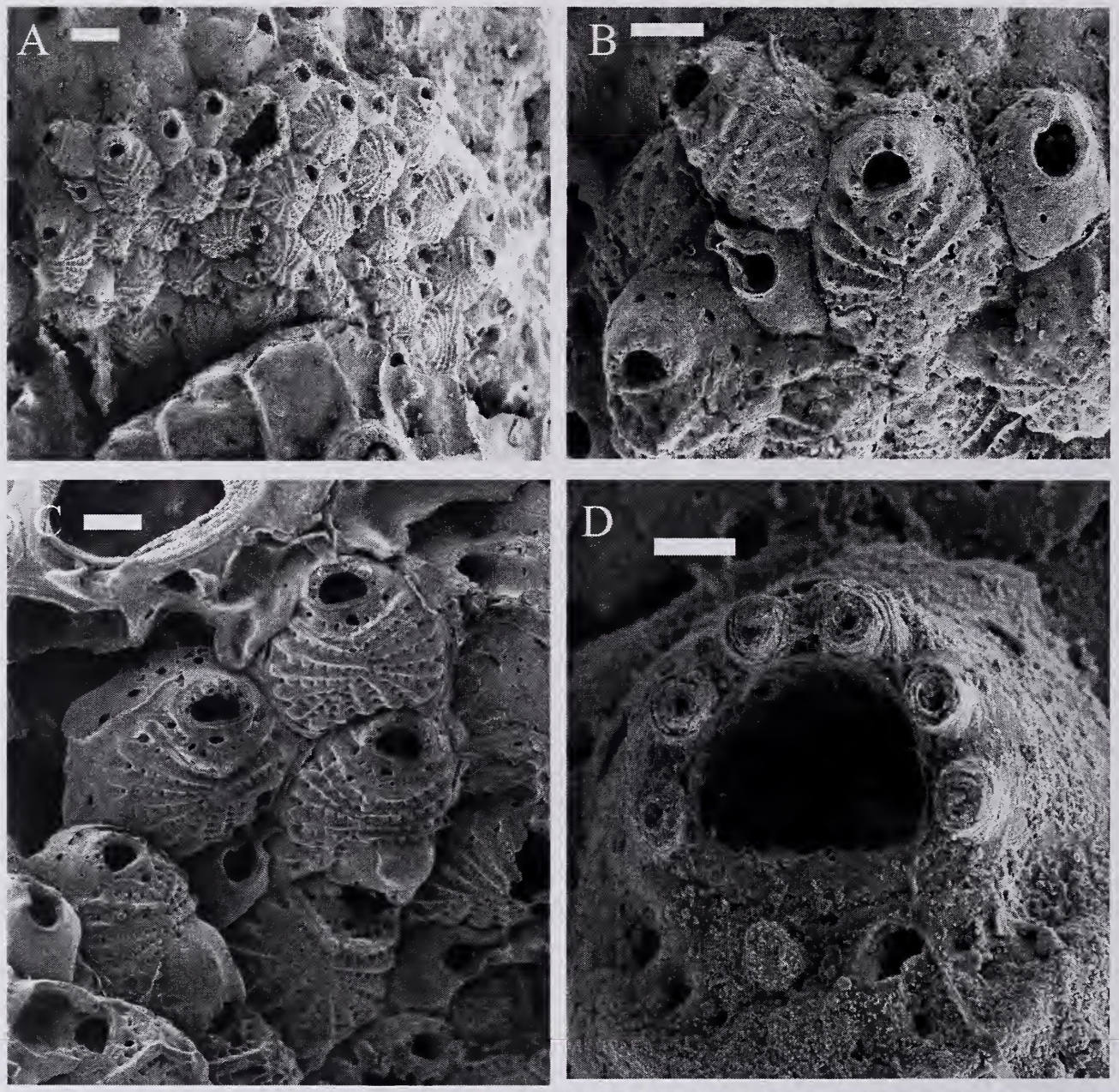

Figure 14. *Puellina smitti.* Hassler Box 2. MCZ100121. A. Entire colony. Scale bar = 200 μm. B. Close-up of zooids at growing edge interspersed with oval avicularian zooids with flared rostra. Scale bar = 100 μm. C. Group of zooids including one ovicelled zooid. Scale bar = 100 μm. D. Close-up of a zooid orifice, showing six spines. Scale bar = 20 μm.

has a largely Southern Hemisphere cold-temperate distribution. Records from more tropical areas possibly refer to one or more undescribed species.

Distribution. Gulf of Mexico. Barbados.

Specimens Examined. MCZ 100123. *Exochella tropica*. Hassler Box 1-2, Barbados, 80 fm. December 1871.

"Grade" Lepraliomorpha Gordon, 1989
Superfamily Smittinoidea Levinsen, 1909
Family Smittinidae Levinsen, 1909

Genus *Smittoidea* Osburn, 1952
Smittoidea reginae new species
Figure 16

Holotype. MCZ 100124. Hassler Box 15, Barbados, 100 fm. December 1871.

Etymology. Species name from Latin: *regina* = queen, *reginae* = of the queen, for its royal necklace of avicularia.

Description. Colony encrusting (Fig. 16A). Zooids large, rectangular to polygonal in shape. Frontal wall covered by granular

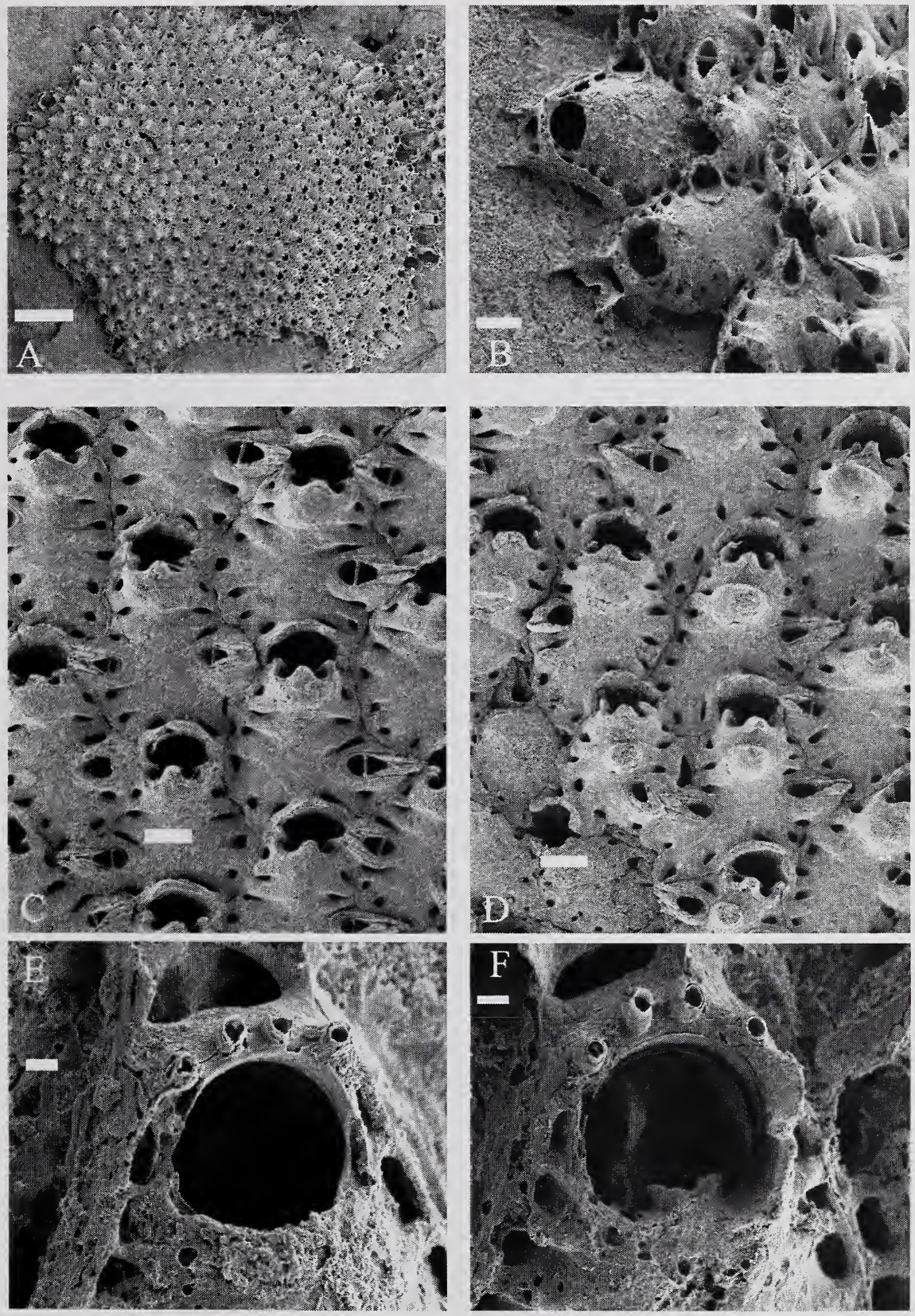

Figure 15. *Exochella tropica*. Hassler Box 1-2. MCZ 100123. A. Entire encrusting colony. Scale bar = 1 mm. B. Close-up of growing edge of colony. Scale bar = 100 μm. C. Group of zooids. Note position of avicularia. Scale bar = 100 μm. D. Another group of zooids with strong development of central umbo. Scale bar = 100 μm. E. Developing hoof-shaped primary orifice showing four orificial spines. Scale bar = 20 μm. F. Another orifice on which development of bifid lyrula has begun. Scale bar = 20 μm.

calcification and rimmed by large marginal pores (Figs. 16B, C). Primary orifice with a high convex lyrula and down-curving condyles. Zooids at growing edge with two to three oral spines (Figs. 16E and F). As zooids mature they develop a low rough-textured peristome. A centered, suboral, oval avicularium plus two distolaterally directed oval avicularia on the edge of the peristome create a jeweled necklace effect (Figs. 16B, C). Some zooids have one or two additional avicularia near the proximal end of the frontal wall. Ovicells round, somewhat immersed, frontal surface with small pores and a rough-textured proximal rim (Fig. 16D).

	Measurements		
	Range	Mean	*N*
Lz	0.473–0.910	0.664	6
Wz	0.364–0.528	0.455	6
Lo	0.118–0.146	0.127	6
Wo	0.091–0.118	0.105	6
Lov	0.182–0.218	0.204	5
Wov	0.273–0.309	0.288	5

Diagnosis. *Smittoidea* with two to three oral spines and peristome bearing three oval avicularia, two lateral and one proximal.

Notes. Some zooids of this colony have a partial second row of pores, perhaps as a result of repair after damage to the colony.

Distribution. Barbados.

Specimens Examined. MCZ 100124. Hassler Box 15, Barbados, 100 fm. December 1871.

Genus *Parasmittina* Osburn, 1952
Parasmittina barbadensis new species
Figures 17, 18

Holotype. MCZ 100125. Hassler Box 12, Barbados, 100 fm. December 1871.

Etymology. Named for the island of Barbados where the species was collected.

Description. Colony encrusting in one or more layers (Fig. 17A). Zooids oval to polygonal in shape with a beaded granular frontal wall, having only a few tiny pores, but with a row of larger, rounded to irregularly shaped marginal pores (Figs. 17A–C). Primary orifice higher than wide (Figs. 17D, E), with a narrow central lyrula and condyles rimmed by overlapping plates, denticulate in appearance at high magnification (Figs. 18C, D). The distal rim of the orifice is beaded (Fig. 18B). Zooids develop a peristome raised laterally to partially cover the lateral rims of the primary orifice. There are one or two oral spines above the distal rim of the orifice (Figs. 17D, E, 18B). Avicularia are varied in size and shape: oval to elongate oval, and triangular. No giant avicularia were found. Oval avicularia with varying orientations occur adjacent to the peristome or on the proximal region of the frontal wall. Broadly triangular avicularia oriented distolaterally to distally are also found adjacent to the peristome. Ovicells transversely oval, with scattered round pores around an imperforate central area.

	Measurements		
	Range	Mean	*N*
Lz	0.655–0.892	0.804	6
Wz	0.400–0.637	0.510	6
Lo	0.127–0.155	0.141	6
Wo	0.127–0.146	0.133	6
Lov	0.237–0.291	0.267	6
Wov	0.291–0.382	0.340	6
Lav	0.127–0.146	0.133	6
Wav	0.055–0.091	0.074	6
Lav2	0.127–0.328	0.176	6
Wav2	0.055–0.200	0.086	6

Diagnosis. Orifice ultrastructure is distinctive; few *Parasmittina* combine a beaded rim and denticulate condyles. *Parasmittina inalienata* Tilbrook, 2006 from the Pacific Solomon Islands is similar in terms of shape of oval avicularia and in having an orifice with narrow condyles, laterally raised peristome, and two oral spines, but that species has only one type of avicularium and lacks the beaded distal rim.

Notes. This species does not correspond with any previously described from the Caribbean–western Atlantic region.

Distribution. Barbados.

Specimens Examined. MCZ 100125. Hassler Box 12, Barbados, 100 fm. December 1871.

Family Bitectiporidae MacGillivray, 1895
Genus *Parkermavella* Gordon & d'Hondt, 1997
Parkermavella salebrosa new species
Figure 19

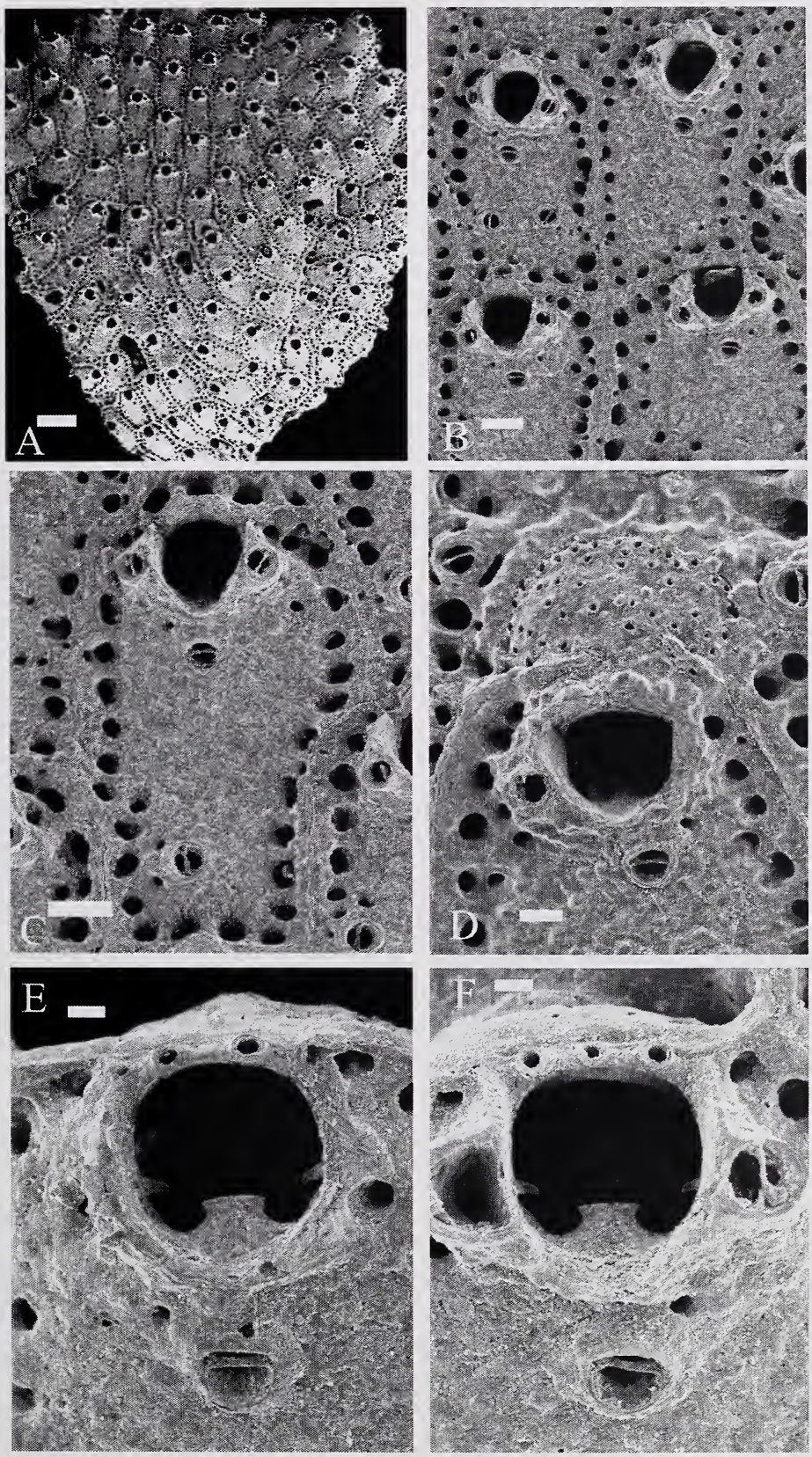

Figure 16. *Smittoidea reginae*. Hassler Box 15. MCZ 100124. A. Encrusting colony fragment. Scale bar = 500 μm. B. Four autozooids. Scale bar = 100 μm. C. Close-up of a single autozooid, showing three avicularia around the peristome and a single proximal avicularium. Scale bar = 100 μm. D. Ovicelled zooid. Scale bar = 100 μm. E. Close-up of an orifice with two distal spines. Scale bar = 20 μm. F. Another orifice with three distal spines. Scale bar = 20 μm.

Holotype. MCZ 100126. Hassler Box 11, Barbados, 100 fm. December 1871.

Etymology. From the Latin adjective *salebrosus,* rough, rugged, uneven, for its unevenly calcified frontal wall.

Description. Colony encrusting, small in size, with sexual reproduction initiated early in astogeny (Fig. 19A). Zooids small, oval to irregularly polygonal in shape, semierect with a flat proximal end and a raised distal end. Frontal wall texture rough and thickened with a few very small frontal pores and a row of larger marginal pores. Primary orifice without a lyrula (Figs. 19B, F). Secondary orifice keyhole shaped, with a transversely oval anterior portion and a straight-sided U-shaped sinus. Peristomial collar flat-topped with six to seven hollow jointed oral spines. Ovicells round, partly immersed, with scattered round pores (Figs. 19C, D). Only two spines visible on ovicelled zooids. Small oval, frontal avicularia with crossbars occur on some zooids.

	Measurements		
	Range	Mean	*N*
Lz	0.364–0.491	0.431	6
Wz	0.328–0.400	0.355	6
Lo	0.091–0.109	0.100	6
Wo	0.091–0.109	0.103	6
Lov	0.200–0.218	0.209	2
Wov	0.182–0.218	0.200	2

Diagnosis. Parkermavella species with six to seven hollow orificial spines, few marginal pores, a round, embedded ovicell with about about 29 pores, some with raised rims, and small oval avicularia on frontal walls of some zooids.

Notes. This is the first species of the genus described from the Atlantic. The other known species have Indo-Pacific distributions. The species also resembles members of the genus *Hemismittoidea* from Hawaii (Soule and Soule, 1973) in its small colony size and general morphology, but lacks the lyrula and avicularia characteristic of that genus.

Distribution. Barbados.

Specimens Examined. MCZ 100126. Hassler Box 11, Barbados, 100 fm, December, 1871.

Genus *Hippoporina* Neviani, 1895
Hippoporina rutelliformis new species
Figure 20

Holotype. MCZ 100127. Hassler Box 2, Barbados, 80 fm. December 1871.

Etymology. From the Latin diminutive of spade, *rutellum,* a small spade or shovel, descriptive of the spade-shaped opening of the avicularia.

Description. Colony encrusting (Fig. 20A). Zooids oval to polygonal in shape. Frontal surface slightly convex, with numerous depressed pores, except around the orifice. Raised lateral walls clearly distinguish zooid margins. Orifice with semicircular anter and wide, barely concave sinus, with two small rounded condyles. Single or paired, flat oval avicularia with crossbar and small columella (Fig. 20B), directed distally to distolaterally, are found beside and just below the orifice. Ovicells (Figs. 20A, D) are large relative to zooid size and have a flattened globular shape. Ovicell opening via maternal zooid operculum. Possible ancestrula (Fig. 20F) similar in shape to autozooids, with four thick oral spines or projections.

	Measurements		
	Range	Mean	*N*
Lz	0.491–0.746	0.604	6
Wz	0.400–0.546	0.470	6
Lo	0.127–0.164	0.149	6
Wo	0.146–0.173	0.155	6
Lov	0.382–0.437	0.410	2
Wov	0.382–0.400	0.391	2
Lav	0.146–0.182	0.161	6
Wav	0.109–0.146	0.121	6

Diagnosis. Hipporina with depressed oval avicularian outlines and spade-shaped openings around skeletal support for mandibles.

Notes. We have tentatively placed this species in *Hippoporina.* The diagnosis of *Hippoporina* given in Hayward and Ryland (1999) states that there are no oral spines in species of the genus. However, the overall morphology of the above species, and in particular, its orifice, is more similar to *Hippoporina* than to *Calyptotheca,* another genus that supposedly lacks spines, but in which at least in one species, *Calyptotheca*

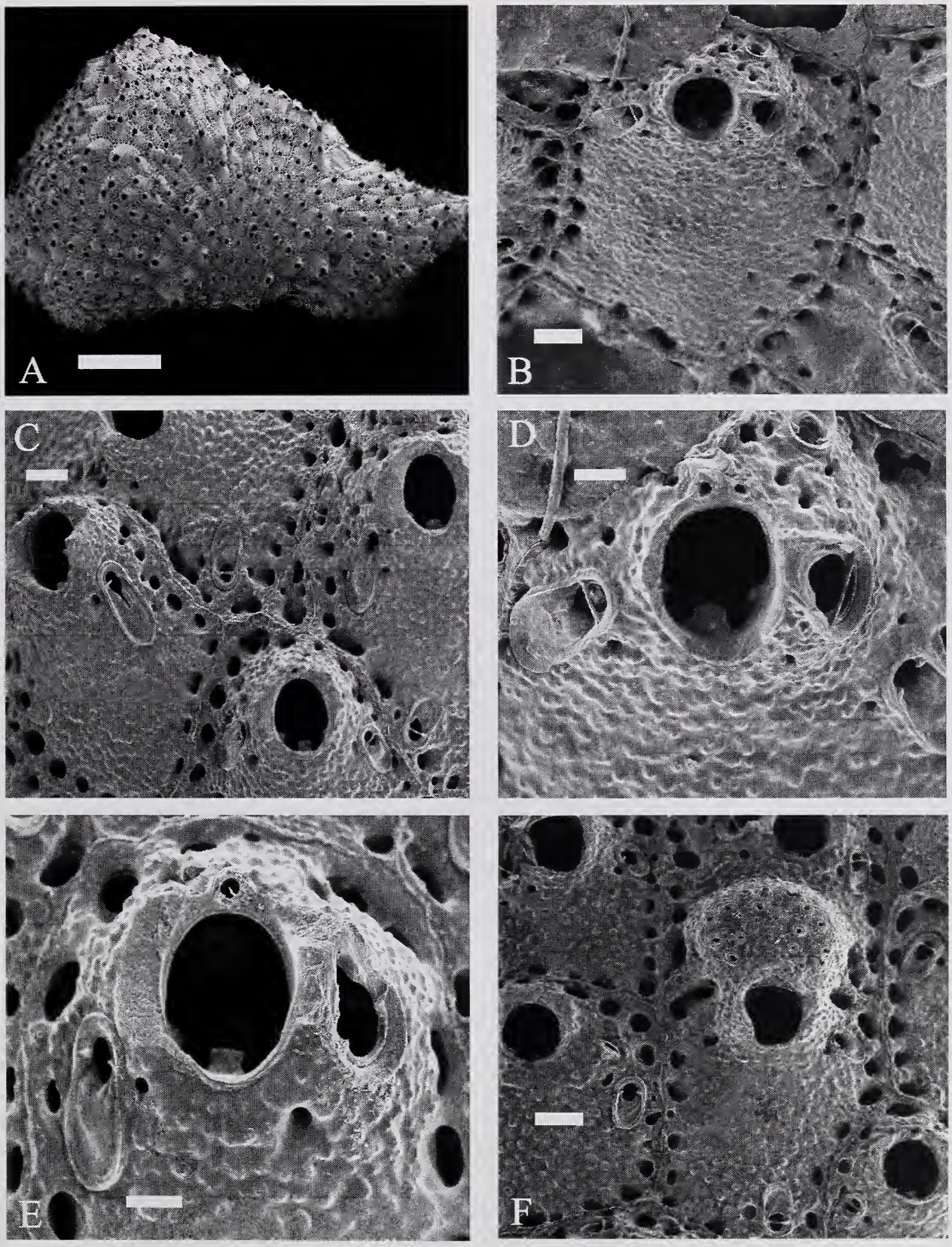

Figure 17. *Parasmittina barbadensis-1.* Hassler Box 12-3. MCZ 100125. A. View of piece of encrusting colony. Scale bar = 2 mm. B. Autozooid with oval and triangular avicularia. Scale bar = 100 μm. C. Zooids with oval and more elongate avicularia. Scale bar = 100 μm. D. Distal end of zooid with two spines. Note narrow lyrula and beaded distal rim of orifice. Scale bar = 50 μm. E. Zooid orifice with one distal spine. Scale bar = 50 μm. F. Ovicelled zooid. Scale bar = 100 μm.

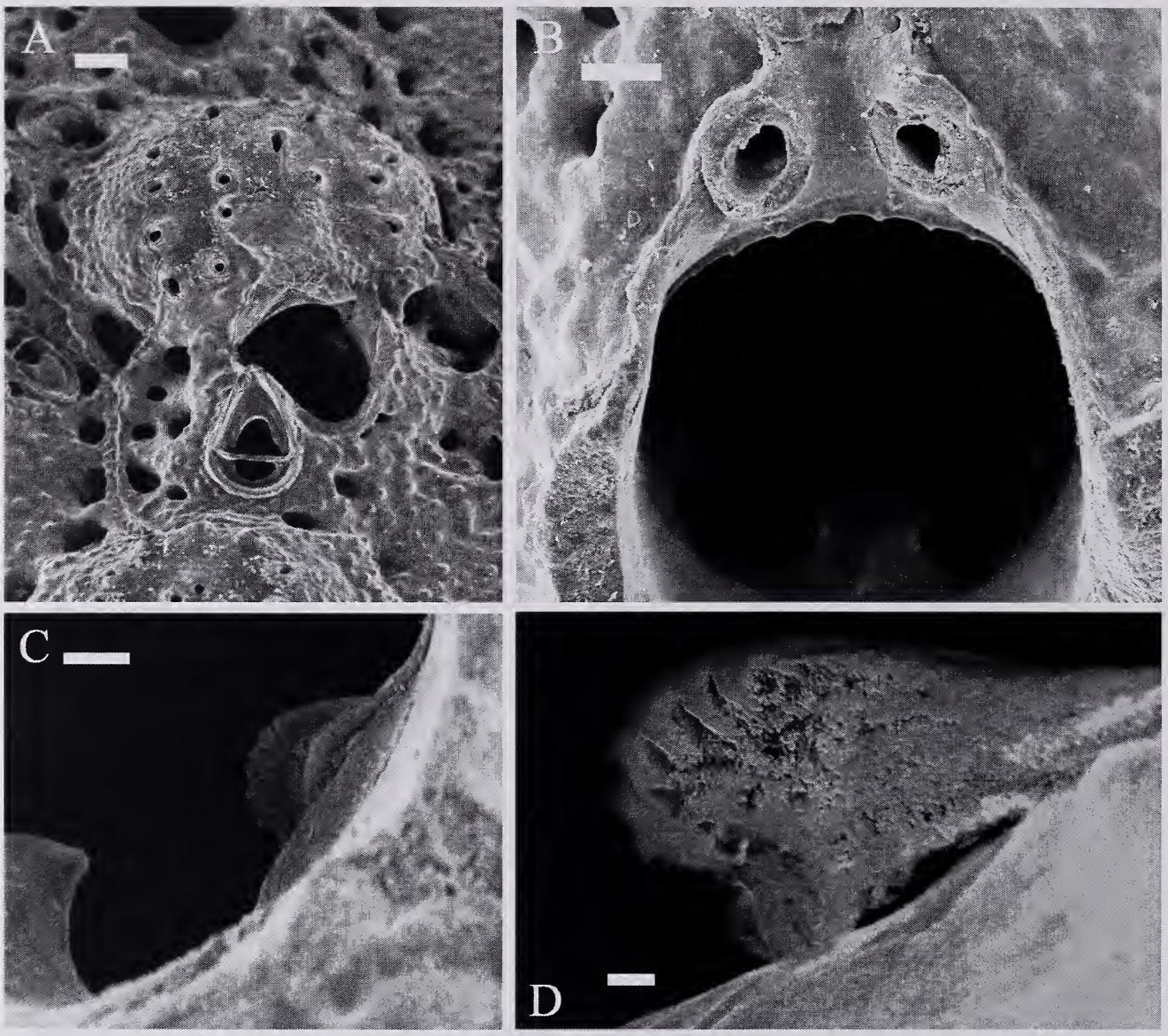

Figure 18. *Parasmittina barbadensis-2*. A. Close-up of another ovicelled zooid. Scale bar = 50 μm. B. Magnified view of orifice to show narrow lyrula and denticulate condyles. Scale bar =20 μm. C. Greatly magnified view of condyle. Scale bar =10 μm. D. Another condyle at higher magnification. Scale bar = 2 μm.

rugosa Hayward, 1974, has oral spines initially that diminish away from the ancestrual region (Hayward and McKinney, 2002, p. 76).

Distribution. Barbados.

Specimens Examined. MCZ 100127. Hassler Box 2, Barbados, 80 fm. December 1871.

Genus *Metroperiella* Canu & Bassler, 1917

Metroperiella agassizi new species

Figure 21

Codonellina montferrandii Lagaaij, 1963: 196, pl. VI, fig. 3. NOT *Flustra montferrandii* Audouin, 1826: 240.

Holotype. *Codonellina agassizi*. MCZ 100128. Hassler Box 11, Barbados, 100 fm. December 1871.

Etymology. Named in honor of Louis Agassiz.

Description. Colony encrusting, unilaminar (Fig. 21A). Zooids oval to polygonal in shape, zooid margins well defined by the raised rims of adjoining lateral walls (e.g., Figs. 21B, C). Frontal shield convex and finely and evenly porous. Orifice (Fig. 21D) horseshoe-shaped, anterior portion transversely oval with short, pointed condyles, posterior portion shallowly U-shaped. It is surrounded by a low peristomial collar with

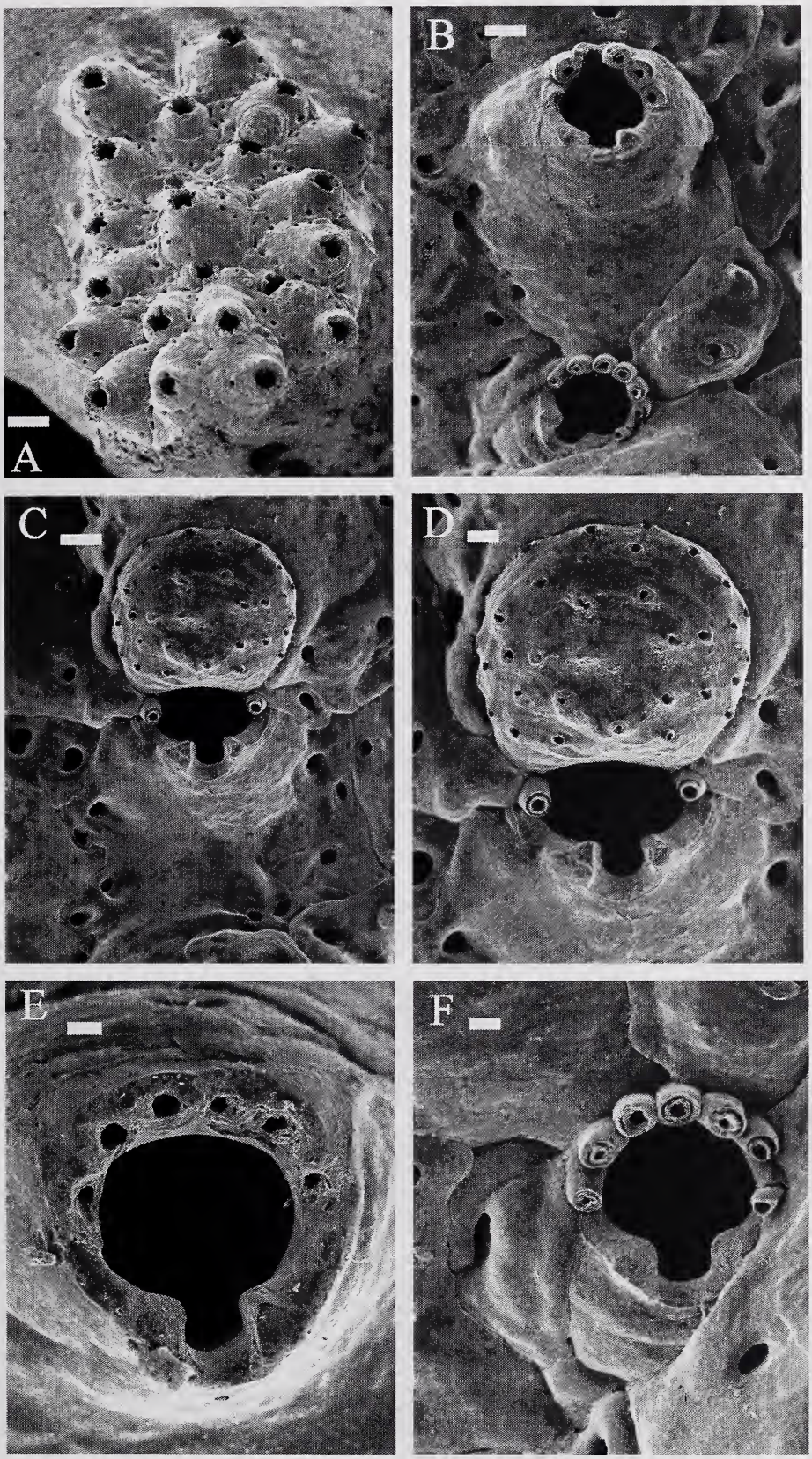

Figure 19. *Parkermavella salebrosa.* Hassler Box 11. MCZ 100126. A. Entire colony. Scale bar = 200 μm. B. Morphology of autozooid. Scale bar = 50 μm. C. Ovicelled zooid. Scale bar = 50 μm. D. Close-up of ovicell and orifice of maternal zooid. Scale bar = 25 μm. E. Orifice with six distal spines. Scale bar = 20 μm. F. Orifice with seven distal spines. Scale bar = 20 μm.

raised lateral lappets. Frontal avicularia with a rounded base, crossbar, and a narrow triangular rostrum are oriented proximolaterally and located below and slightly to one side of the midpoint of the proximal margin of the orifice (Figs. 21C–F). Ovicells globular, prominent, with an imperforate proximal rim, and with the rest of its frontal surface perforated by about 30–40 round pores (Fig. 21E). Ovicell closed by maternal zooid operculum.

	Measurements		
	Range	Mean	*N*
Lz	0.637–0.801	0.716	6
Wz	0.455–0.528	0.485	6
Lo	0.146–0.182	0.168	6
Wo	0.127–0.146	0.137	6
Lov	0.218–0.364	0.270	6
Wov	0.255–0.309	0.276	6
Lav	0.146–0.182	0.156	6
Wav	0.073–0.082	0.077	6

Diagnosis. *Metroperiella* with monomorphic, narrow, sharp-pointed, and asymmetrically placed avicularia. In comparison, Indo-Pacific species have two or three types of avicularia, smaller pointed avicularia and large spatulate avicularia and more oval, less sharply pointed avicularia in a more centered position below the orifice and smaller relative to zooid size (e.g., Harmer, 1957; Tilbrook, 2006).

Notes. Tilbrook (2006) has recently reviewed the species and listed the specimens he examined. *Metroperiella montferrandii* may be truly circumtropic, having been recorded from west Africa, the Mediterranean, and Indo-Pacific and eastern Pacific (Galapagos). It may also represent a complex of closely related species. Tilbrook (2006) describes one such new species, *Metroperiella circumflexa*, from the Solomon Islands and discusses another, *Metroperiella biformis* (Zhang and Liu, 1995), from China.

Distribution. Gulf of Mexico, Caribbean.

Specimens Examined. MCZ 100129. Hassler Box 2, Barbados, 80 fm. December 1871. MCZ 100128. Hassler Box 11, Barbados 100 fm. December 1871.

Superfamily Schizoporelloidea Jullien, 1883
Family Schizoporellidae Jullien, 1883
Genus *Stylopoma* Levinsen, 1909

cf Stylopoma smitti Winston, 2005
Figure 22A–C

Hippothoa spongites Smitt, 1873: 42 (in part).
Hippothoa or *Schizoporella spongites* Verrill, 1900: 592. ???
Schizoporella spongites Osburn, 1914: 207 (at least in part).
Stylopoma spongites Long & Rucker, 1970: 19, fig. 3:6; Winston, 1982: 146, fig. 78.
Stylopoma smitti Winston, 2005: 72, figs. 190–195.

Description. Colony encrusting to multilaminar (Fig. 22A). Zooids of primary layer of colony oval to rounded quadrangular; zooids of frontally budded layers irregularly polygonal. Frontal wall convex, granular, heavily calcified, with numerous medium-sized pores (Fig. 22B). Orifice positioned just below the distal rim, often slightly off center. Anterior part of orifice semicircular, posterior part flat with a central deeply slit, U- to almost teardrop-shaped sinus (Fig. 22C). Tab-shaped condyles extend almost to the sinus. A granular-textured umbo often may occur on the frontal wall just below the sinus. A low beaded peristomial rim surrounds the orifice. Small cross-barred avicularia, rounded proximally, with an equilaterally triangular mandible, occur on the frontal wall, at or below the level of the sinus and directed distolaterally. Occasional large spatulate, interzooidal avicularia may also occur. No ovicells were present on the Barbados specimens, but those of Florida specimens of *Stylopoma smitti* are large and spherical, covering part of the frontal surface of several zooids. They have a rough-textured surface covered with smaller and more closely spaced pores than those of zooid frontal walls, but no avicularia (see Winston, 2005, fig. 198).

	Lz	Wz	Lo	Wo	Lav	Wav
N	6	6	6	6	6	6
Mean mm	0.528	0.355	0.121	0.127	0.067	0.053
St Dev mm	0.064	0.038	0.009	0.010	0.009	0.004
Range						
min	0.419	0.309	0.109	0.118	0.055	0.046
max	0.601	0.419	0.127	0.146	0.073	0.055

Notes. Zooids of this young colony have orifices that are more U- than teardrop-shaped and have shorter, more curved condyles than orifices of the larger fragment found. This may

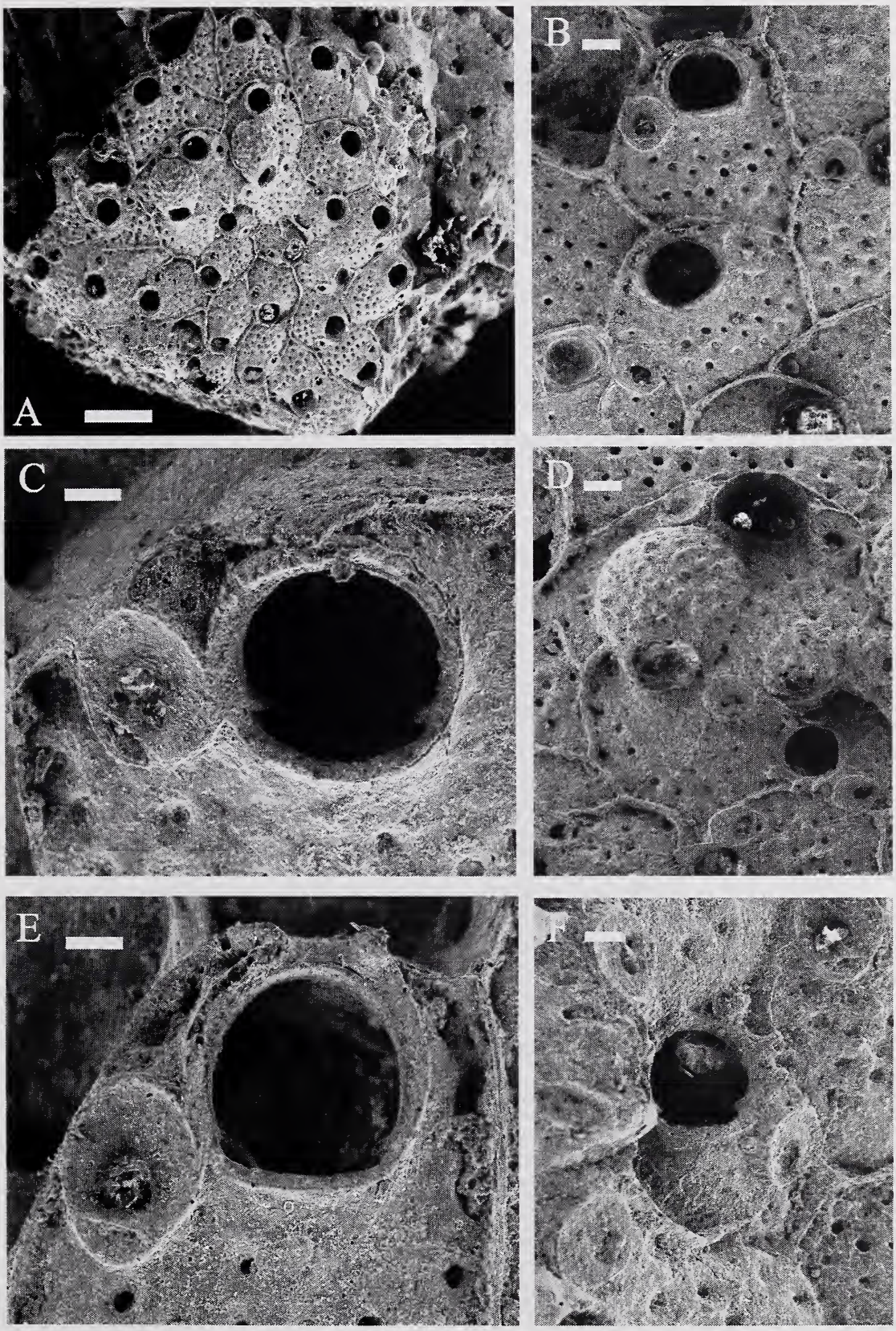

Figure 20. *Hippoporina rutelliformis*. Hassler Box 2. MCZ 100127. A. Low-magnification view of most of encrusting colony. Scale bar = 50 μm. B. Two autozooids near growing edge. Note shape of calcified parts of avicularia. Scale bar = 100 μm. C. Orifice, showing small blunt pointed condyles. Scale bar = 50 μm. D. Ovicelled zooid. Scale bar = 100 μm. E. Zooid at growing edge with two oral spines. Scale bar = 50 μm. F. Ancestrula or pseudoancestrula with spiny processes around the orifice peristome. Scale bar = 50 μm.

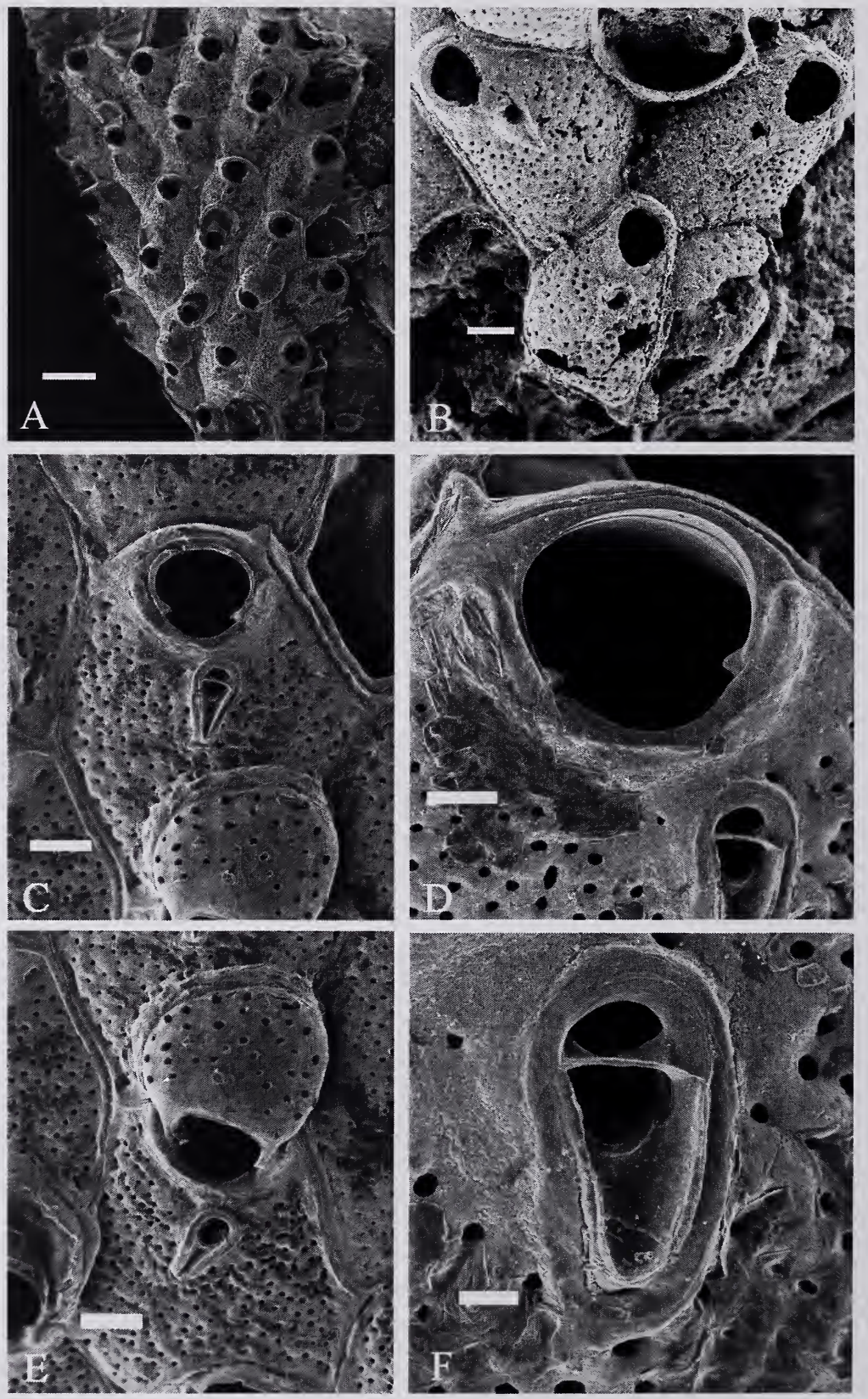

Figure 21. *Metroperiella agassizi.* Hassler Box 11. MCZ 100128. A. View of most of a small colony. Scale bar = 500 μm. B. Skeletal and partially broken zooids, showing shape and position of frontal avicularia. Scale bar = 100 μm. C. Single autozooid to show orifice shape and position and orientation of frontal avicularium. Scale bar = 100 μm. D. Close-up of orifice of zooid at the growing edge of colony. Scale bar = 50 μm. E. An ovicelled zooid. Scale bar =100 μm. F. Close-up of an avicularium. Scale bar = 20 μm.

reflect astogenetic variation, i.e., the zone of astogenetic change, vs. the zone of astogenetic repetition, but considering the importance of orifice morphology in *Stylopoma* species (and other cheilostomes as well), the two are here considered to represent different species. Both species have orifices with a noticeably granular distal peristome rim, similar porous frontal walls, and broad, triangular frontal avicularia tilted forward and directed distolaterally. However, in addition, the orifice of the Barbados *S. smitti* is closer to the zooid center than to lateral walls, zooids are flatter, and frontal avicularia are smaller.

Distribution. Florida, Barbados.

Specimens Examined. MCZ 100130. Hassler Box 1-2. Barbados, 80 fm. December 1871.

Stylopoma haywardi new species
Figures 22 D–F

Holotype. MCZ 100131. Hassler Box 1-1, Barbados, 80 fm. December 1871.

Etymology. Named in honor of bryozoan taxonomist, Peter J. Hayward.

Description. Colony encrusting in one or more layers. Zooids of primary layer of colony (only layer present on this colony) rounded quadrangular (Figs. 22E, F). Frontal wall granular, heavily calcified, with numerous medium-sized pores, and fairly flat except for an imperforate median umbo. Orifice positioned just below the distal rim, quite off center, almost to the lateral edge of the zooid, except in the case of zooids with two avicularia (see Fig. 22E). Anterior part of orifice semicircular, posterior part flat, with a central deep teardrop-shaped sinus. Broad straight condyles extend almost to the inner edges of the sinus (Fig. 22D). A low beaded peristome rims the orifice. Small cross-barred avicularia, rounded proximally, with an equilaterally triangular mandible, occur on the frontal wall, at about the level of the sinus. They have a raised beaded rostrum and are directed distolaterally. Paired frontal avicularia occur on some zooids. Occasional large spatulate interzooidal avicularia (Fig. 22F) may also occur. No ovicells were present on the Barbados specimens.

	Lz	Wz	Lo	Wo	Lav	Wav
N	6	6	6	5	6	6
Mean mm	0.497	0.343	0.112	0.124	0.077	0.056
St Dev mm	0.038	0.033	0.012	0.008	0.014	0.007
Range						
min	0.455	0.309	0.091	0.109	0.055	0.046
max	0.546	0.400	0.127	0.127	0.091	0.064

Diagnosis. Encrusting *Stylopoma* with the following distinguishing suite of autozooid characters: zooids flat except for large median umbo, orifice with condyles in the form of long bars, sinus an elongate keyhole shape, triangular frontal avicularia on one or both sides the orifice, orifice close to a lateral wall of zooid, except when avicularia are paired, elongate spatulate avicularia.

Notes. The Caribbean is known to be diverse in *Stylopoma* species, with more than 15 known, although not all have been described and named. *Stylopoma haywardi* can be distinguished from the following Caribbean species on the basis of autozooid characters, despite the lack of ovicells in the colony found. *Stylopoma smitti* has more convex zooids with a more centered orifice having up-curved, tab-shaped condyles, and a less constricted, more U-shaped sinus. It is one of the smallest species, in terms of autozooid length and width, but the other species with small zooids, *Stylopoma minuta*, has a more centered orifice, a more convex, distally raised frontal surface, and a very broad spatulate avicularium. Autozooids of *Stylopoma haywardi* resemble those of *Stylopoma projecta* in having an orifice with bar-shaped condyles and keyhole-shaped sinus, but *S. projecta* can be tubular erect, as well as encrusting, in growth form, has longer and narrower zooids, and much narrower frontal avicularia that are often paired and also scattered on other parts of frontal surface, not just around the orifice. Specimens from Belize cryptic reef habitats (Winston, 1984), called *Stylopoma spongites* in that work, have a larger size, tabbed condyles, and pointed spatulate avicularia.

Distribution. Barbados.

Specimens Examined. MCZ 100131. Hassler Box 1-1, Barbados, 80 fm. December 1871.

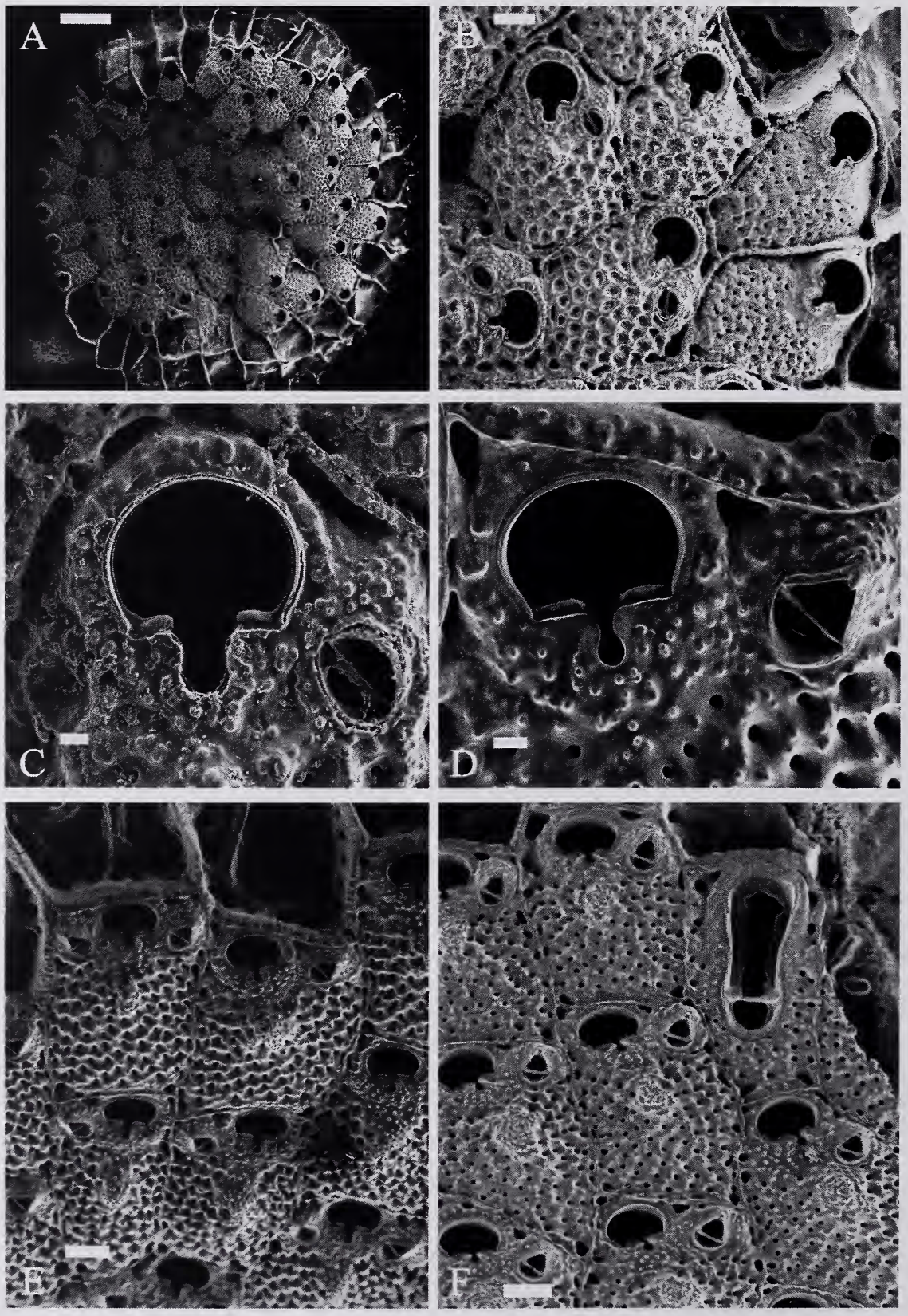

Figure 22. *Stylopoma smitti* and *Stylopoma haywardi*. (A–C, *S. smitti*, Hassler Box 1-2. MCZ 100130.) A. Entire juvenile colony. Scale bar = 500 μm. B. Group of autozooids at growing edge of colony. Scale bar = 100 μm. C. Distal end of autozooid of same colony showing orifice shape and small frontal avicularium. Scale bar = 200 μm. (D–F, *S. haywardi*, Hassler Box 1-1. MCZ 100131.) D. Orifice of zooid from second colony to show orifice shape and morphology of frontal avicularium. Scale bar = 20 μm. E. Group of autozooids of this colony near growing edge. Scale bar = 100 μm. F. Another group of zooids showing large spatulate interzooecial avicularium. Scale bar = 100 μm.

Family Gigantoporidae Bassler, 1935
Genus *Barbadiopsis* new genus

Etymology. Named after the island where it was collected on the *Hassler* Expedition.

Description. Zooids very large in size, proximal frontal wall with small pores or almost imperforate, distal wall swollen and raised by the large cystids of paired avicularia, whose elongate triangular rostra are directed distolaterally or laterally over the orifice. Avicularian mandibles are distinct, long, pointed, and curving with a serrated edge and winglike central expansions. Primary orifice hoof-shaped, with small but noticeable condyles and immersed in a rounded peristome. Ovicells with small frontal pores lost with increasing calcification or initially with only marginal pores apparent. Type species, *Barbadiopsis trepida*, new species. Other species included in this genus, *Barbadiopsis* (*Cosciniopsis*) *rubra* (Osburn, 1940).

Diagnosis. The genus is characterized by very large, rough-textured zooids, with large-bodied, raised avicularia surrounding the orifice and oriented toward each other. The avicularia have curved, pointed mandibles with serrations and a lateral expansion along one side.

Notes. The Caribbean reef-associated species *Gephyrophora rubra* Osburn, 1940 was synonymized by Cook (1985) under *Aptonella violacea* Canu & Bassler, 1928b. Tilbrook et al. (2001) disagreed with this decision, placing Osburn's species in *Cosciniopsis*. This is a better fit in terms of frontal wall and orifice, but the very enlarged avicularia with their unique winged mandibles shared by the two Caribbean species seemed to us to merit a separate genus within the Gigantoporidae.

Barbadiopsis trepida new species
Figures 23, 24

Holotype. MCZ 100132. Hassler Box 15, Barbados, 100 fm. December 1871.

Etymology. From the Latin adjective *trepidus* = anxious, alarmed, because of the raised eyebrow orientation of the paired oral avicularia.

Description. Colony nodular, encrusting; coarse-textured due to the large size and shape of the partially erect zooids (Fig. 23A). Zooids very large, oval to almost circular in frontal view. Frontal wall imperforate except for a few marginal pores. Primary orifice hoof-shaped, longer than wide, with short condyles and a U-shaped proximal portion. A raised peristome with lateral lappets extends into a partial peristomial bridge above the orifice (Fig. 23B). Bulbous paired avicularia with coarsely porous calcification are raised on either side of the orifice, their mandibles pointing distolaterally toward each other (Fig. 24A). The mandible is elaborate, a narrow spear-shaped central spine with a thin shallow distal wing with short serrations along its distal edge (Figs. 24B–D). Ovicells prominent, globular, with granular calcification and few pores. Ovicells open into zooid peristomes.

	Measurements		
	Range	Mean	*N*
Lz	0.728–1.019	0.861	6
Wz	0.601–0.946	0.719	6
Lo	0.200–0.237	0.215	6
Wo	0.146–0.200	0.179	6
Lov	0.291–0.291	0.291	1
Wov	0.382–0.382	0.382	1
Lav	0.200–0.309	0.252	6
Wav	0.109–0.182	0.133	6

Diagnosis. *Barbadiopsis* with proximal frontal wall imperforate, distal wall swollen and raised by large paired avicularia whose elongate triangular mandibles are directed distolaterally, their tips meeting above the orifice. The peristome may form a partial bridge across the orifice.

Notes. In the Caribbean species *B. rubra* Osburn (1940) the proximal frontal surface is also coarsely granular but with small pores interspersed, and the raised paired avicularia are directed laterally across the orifice rather than above it. Canu and Bassler (1928b) described *Barbadiopsis imperfecta* from Brazil. It has more distally pointed avicularia, a raised umbo beneath the orifice, and a finely granulose and porous frontal wall.

Distribution. Barbados

Specimens Examined. MCZ 100132. Hassler Box 15, Barbados, 100 fm. December 1871.

Family Teuchoporidae Neviani, 1895
Genus *Lagenicella* Cheetham & Sandberg, 1964
Lagenicella verrucosa (Canu & Bassler, 1928)
Figure 25

Lagenipora verrucosa Canu & Bassler 1928:137, pl. 21, figs. 5–8. Osburn, 1947: 41.

Description. Colony encrusting, uniserial, branching, creeping over calcareous substrata, and sometimes intertwined with species with vinelike growth (e.g., Figs. 25A, B). Zooid shape is elongate-oval and shallowly convex up to the distal end, which rises into a thick, imperforate tubular peristome around the orifice. Lateral walls are smoothly calcified with pores apparent. Zooid frontal walls (except for the peristome) have numerous small pores and between them, rough-textured calcification in the form of tubercles and forked spines (Fig. 25D). Some zooids, as Canu and Bassler pointed out in their original description, are much more verrucose than others. The primary orifice is elliptical, longer than wide, and can only be seen on developing zooids (Fig. 25C). Avicularia are lacking, although there appear to be paired pores or slight projections on the lateral sides of peristome rims of some zooids. Ovicells are hemispherical, with a semicircular window showing the inner layer; calcification may bear projecting spines (Figs. 25E, F) but no pores. Ovicells are positioned on the outside distal wall of the peristome and open into the peristome.

	Measurements		
	Range	Mean	*N*
Lz	0.601–0.819	0.652	6
Wz	0.273–0.328	0.303	6
Lo	0.091–0.109	0.103	3
Wo	0.091–0.091	0.091	3
Lov	0.109–0.109	0.109	1
Wov	0.182–0.182	0.182	1
Lo2	0.091–0.146	0.132	4
Wo2	0.109–0.164	0.137	4

Notes. The taxonomic problem of which species belong to *Lagenicella* and which to *Lagenipora* hasn't been resolved. In frontal wall structure this species seems closest to *Lagenicella* as described by Cheetham and Sandberg (1964); however, it does not have avicularia, or pores in the ovicells.

Distribution. Caribbean.

Specimens Examined. MCZ 100133. Hassler Box 6, Barbados, 100 fm. December 1871.

Family Microporellidae Hincks, 1880
Genus *Microporella* Hincks, 1877
Microporella protea Winston, 2005
Figure 26

Porellina ciliata Smitt, 1873: 26, pl. VI, figs. 128–129. [not figs. 126, 127]. NOT *Eschara ciliata* Pallas, 1766: 38.

?*Microporella ciliata personata* Osburn, 1947: 36. NOT *Microporella personata* Busk, 1854: 74, pl. XC, figs. 24.

Microporella ciliata Long & Rucker, 1970: 20, fig. 4:3.

Microporella protea Winston, 2005: 78, figs. 211–213, 215, 217–223.

Description. Colony encrusting in one or more layers (Fig. 26A). Zooids irregularly rhomboidal in shape, with granular frontal surfaces penetrated by numerous irregularly shaped pores (Fig. 26B). Zooids separated by shallow grooves, becoming less distinct with age; junction of the intercalary cuticles of adjacent zooids wavy. Thickening and increasing irregularity of the frontal wall occurs as secondary calcification progresses, with pores becoming deeply sunken or obscured. Orifice semicircular, with no condyles, but with three to four hollow jointed oral spines and with granular-to-beaded calcification outside its proximal margin (Fig. 26C). A slightly raised collar surrounds the crescentic, denticulate ascopore located just below the orifice. Proximal to the ascopore at about the midpoint of the zooid length is a large, very broad, laterally directed avicularium with a complete crossbar. Globose ovicells, covered with the same thick granular-to-pustulose calcification as zooids, may show poorly developed ribs. The maternal zooid peristome curves around into two projecting arms (Fig. 26D) or forms a proximal bridge across the secondary orifice.

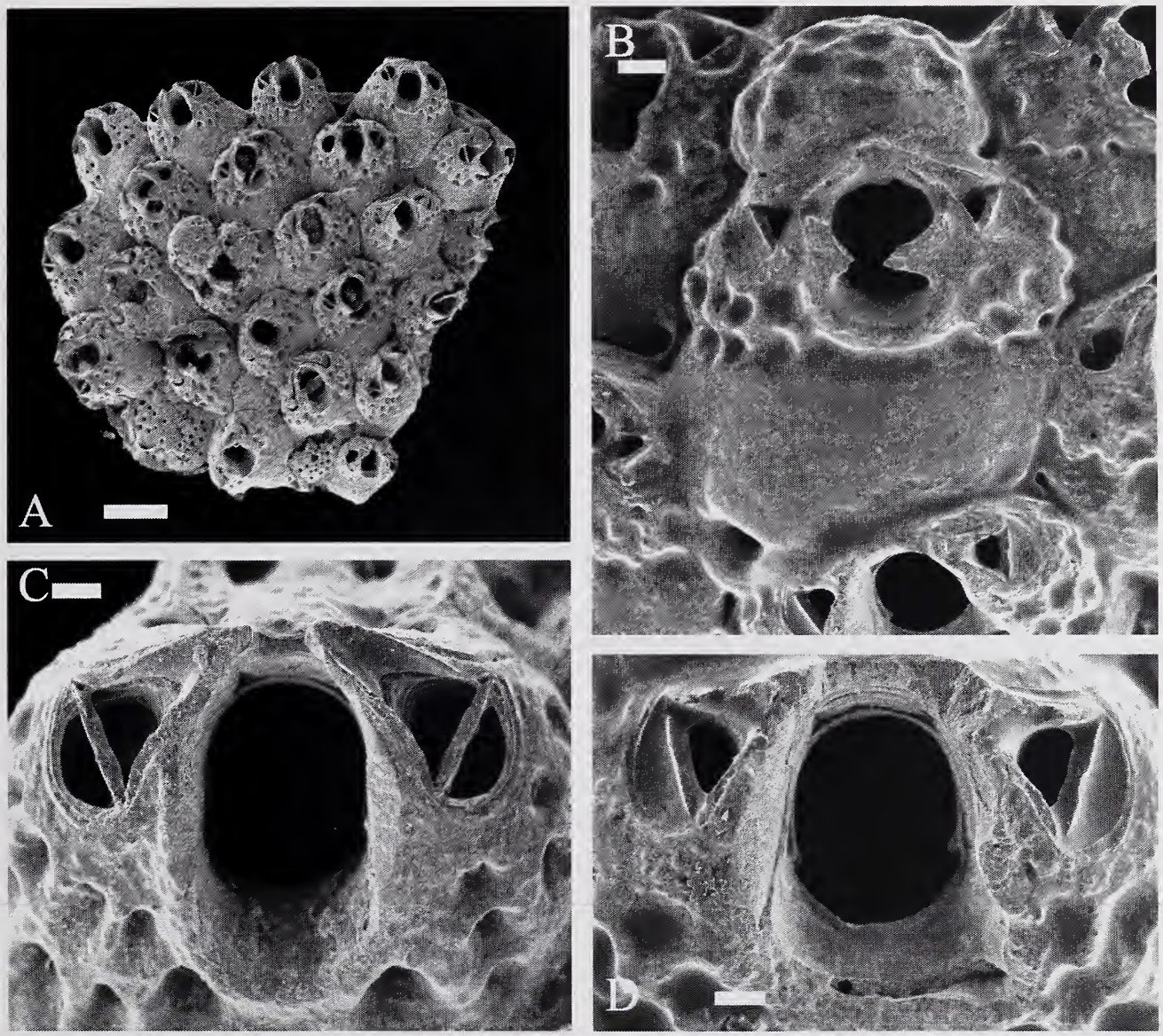

Figure 23. *Barbadioposis trepida-1.* Hassler Box 15. MCZ 100132. A. Small nodular colony. Scale bar = 500 μm. B. A single ovicelled zooid. Scale bar = 100 μm. E. Close-up of autozooid orifice and paired avicularia. Scale bar = 50 μm. D. Another autozooid orifice with its paired, raised avicularia. Scale bar = 50 μm.

	Measurements		
	Range	Mean	*N*
Lz	0.528–0.673	0.582	6
Wz	0.346–0.473	0.434	6
Lo	0.073–0.91	0.077	6
Wo	0.109–0.127	0.120	6
Lov	0.164–0.218	0.199	6
Wov	0.273–0.309	0.291	6
Lav	0.091–0.127	0.112	6
Wav	0.073–0.091	0.080	6

Notes. When the heavily calcified colonies encrust narrow substrata they may resemble erect branches (Fig. 26A).

Distribution. Florida, Barbados.

Specimens Examined. MCZ 100134. Hassler Box 12-1, Barbados, 80 fm. December 1871.

Family Escharinidae Tilbrook, 2006
Genus *Bryopesanser* Tilbrook, 2006
Bryopesanser pesanseris (Smitt, 1873)
Figure 27

Hippothoa pesanseris (Smitt 1873): 43.

Escharina pesanseris Osburn, 1914: 207; Cook, 1968:195; Long & Rucker, 1970: 19; Winston, 1982: 145; 1984; 26, figs. 53–55.

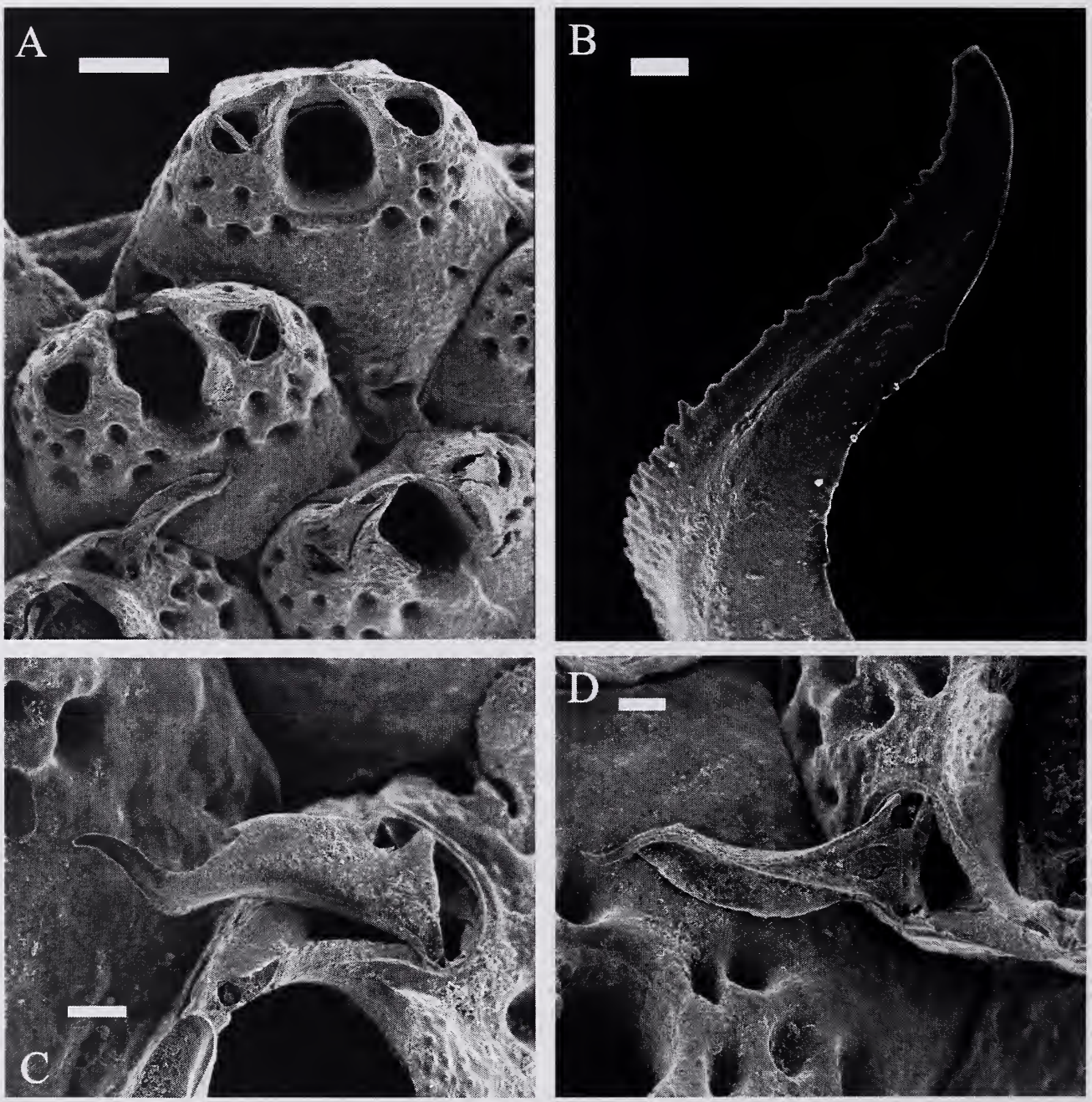

Figure 24. *Barbadioposis trepida-2.* A. Partially cleaned zooids, showing avicularian mandibles. Scale bar = 200 μm. B. Close-up of a single mandible. Note edge serrations. Scale bar = 10 μm. C. Avicularian mandible in closed position. Scale bar = 50 μm. D. Another mandible in open position. Scale bar = 50 μm.

Mastigophora pesanseris Osburn, 1927: 130; 1940: 452.
Canu & Bassler 1928a: 133; Marcus 1939: 142.
Bryopesanser pesanseris Tilbrook, 2006: 253, pl. 55A–C

Description. Colonies encrusting, small, and single layered (Fig. 27). Zooids oval to subhexagonal, frontal shield calcification with a granular texture, perforated by many very small pores. Orifice semicircular with a small, narrow, teardrop-shaped central sinus. Around the orifice is a low flat-topped peristome with seven hollow spines along its distolateral rim. Paired avicularia have complete crossbars and pointed rostra, flared into a terminal groove to support the characteristic webbed "duck foot" mandibles. Ovicells (not present on the juvenile colony found in the Barbados collection) are small and globular, with no pores. Ancestrula (missing from colony illustrated here, but illustrated in Winston [1984, fig. 55]) almost identical to that of *Bryopesanser latesco*, an Indo-Pacific species described by Tilbrook (2006), with 10

spines and an opesia taking up the distal half of the zooid.

Notes. Tilbrook (2006) created the family Escharinidae, including in it the new genus *Bryopesanser*, with *Bryopesanser pesanseris* (Smitt) as the type species. Members of the genus are not uncommon in tropical and subtropical habitats, but the amount of variation within the genus has only recently been recognized, no doubt partly due to the small size and ephemeral life histories of its species.

Measurements. No measurements were made on this immature and partly broken colony that had settled on a dead *Steginoporella* zooid. Mean zooid length and width in mature Belize colonies was 0.54 × 0.39 mm (Winston, 1984).

Distribution. Warm waters of eastern and western Atlantic and Caribbean regions, possibly eastern Pacific also.

Specimens Examined. MCZ 100135. Hassler Box 12 on *Steginoporella magnilabris* specimen. Barbados, 100 fm, December 1871.

Superfamily Mamilloporoidea Canu & Bassler, 1927

Family Cleidochasmatidae Cheetham and Sandberg, 1964

Genus *Gemelliporina* Bassler, 1936

Gemelliporina hastata new species

Figure 28

Holotype. MCZ. 100136. Hassler Box 8, Barbados, 100 fm. December 1871.

Etymology. From Latin *hastatus -a -um* = armed with a spear, for its orificial avicularia.

Description. Colony unjointed, rigidly calcified, erect, with cylindrical branches (Fig. 28A). Zooids oval to rectangular in shape, frontal shield calcification imperforate except for marginal areolae and pustulose in texture (Figs. 28B and E). Zooids flat proximally, curved upward and outward into a peristome distally. Zooid margins slightly depressed, a scalloped line marking position of adjacent vertical walls. Primary orifice hidden by peristome (partially visible in Figs. 28C, D). Peristome opening has an asymmetrical sinus, on the side of which a small avicularium with a pointed rostrum is positioned (Fig. 28E). Ovicells rounded and slightly raised, outlined by pores, with scattered small pores and sometimes a large round central pore on their frontal surface (Figs. 28B, F).

	Measurements		
	Range	Mean	*N*
Lz	0.855–1.219	1.037	6
Wz	0.473–0.746	0.634	6
Lo	0.200–0.237	0.215	6
Wo	0.146–0.182	0.161	6
Lov	0.364–0.455	0.413	3
Wov	0.510–0.637	0.564	3
Lav	0.073–0.100	0.084	4
Wav	0.055–0.064	0.059	4

Diagnosis. Distinguished from the more common Caribbean species *Gemelliporina glabra* (Smitt) 1873 by its larger zooid size and by its raised peristome and peristomial avicularium. Distinguished from the fossil species *Gemelliporina punctata* (Canu & Bassler) 1919, which appears to have a similar round pore in the ovicell, by its peristomial avicularia and asymmetrical peristome sinus, as well by as its larger zooid size.

Notes. The material examined consisted of old basal portions of colonies in which the primary orifice (and presence of spines, if any) could not be observed. However, the overall morphology of the Barbados species corresponds well with those of the two other species known from the region, the fossil and Recent *G. glabra* (Cape Hatteras to Brazil, and Caribbean–Gulf of Mexico) and the fossil species *G. punctata* (Bowden bed, Miocene, Jamaica), so we have placed it with them in *Gemelliporina*.

Distribution. Barbados.

Specimens Examined. MCZ 100136. Hassler Box 8, Barbados, 100 fm. December 1871.

Superfamily Celleporoidea Johnston, 1838

Family Celleporidae Johnston, 1838

Genus *Buffonellaria* Canu & Bassler, 1927

Buffonellaria ensifera new species

Figures 29, 30

Holotype. MCZ 100137. Hassler Box 15, Barbados, 100 fm. December 1871.

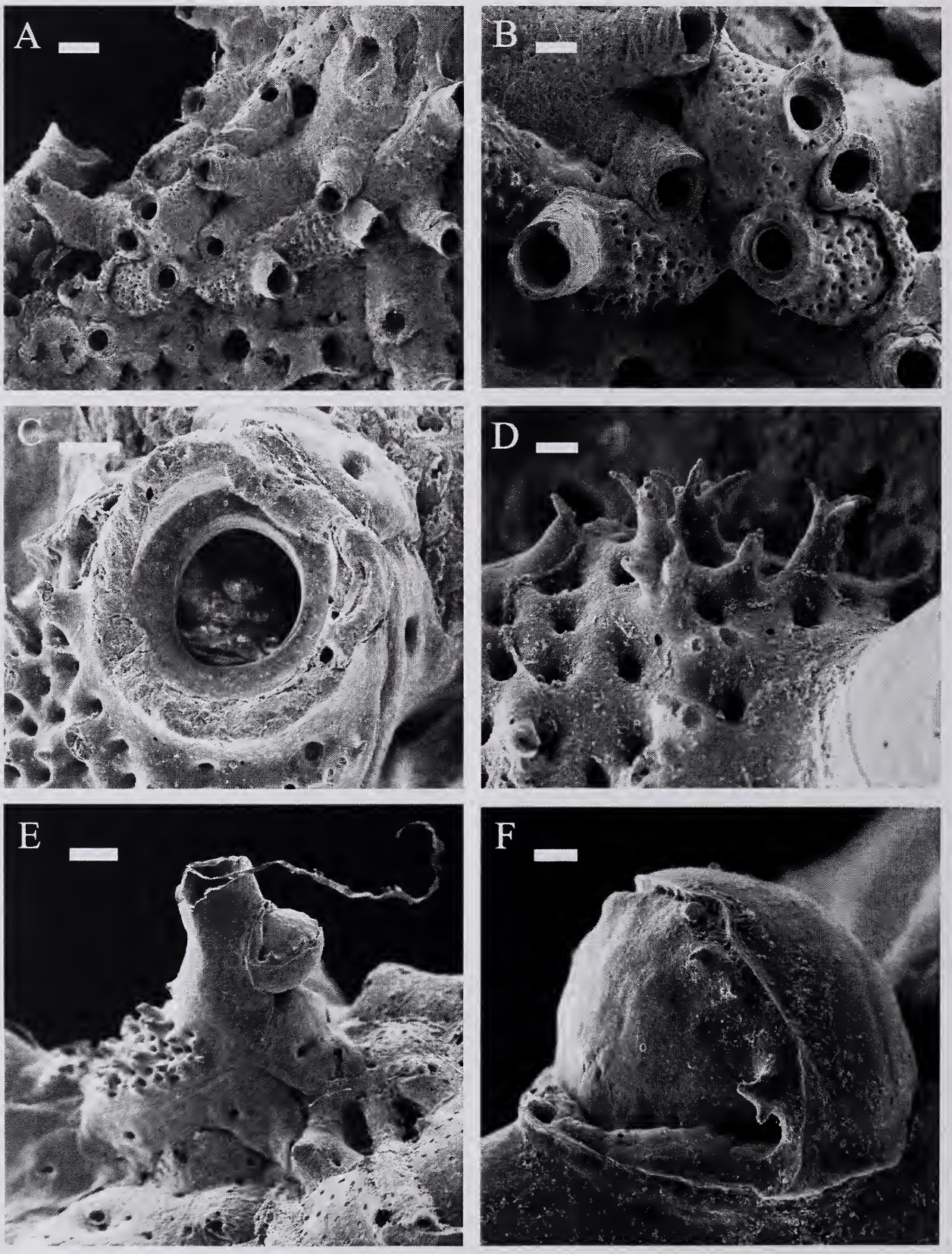

Figure 25. *Lagenicella verrucosa*. Hassler Box 6. MCZ 1000133. A. *Lagenicella* colony intertwined with cyclostome colony (*Proboscina*). Scale bar = 200 μm. B. Three *Lagenicella* zooids and adjacent cyclostome zooids. Scale bar = 100 μm. C. Orifice (near level of primary orifice and developing peristome). Scale bar = 50 μm. D. Spiny and knobby calcified projections on frontal shield. Scale bar = 20 μm. E. Ovicelled zooid in side view. Scale bar = 100 μm. F. Close-up of ovicell. Scale bar = 20 μm.

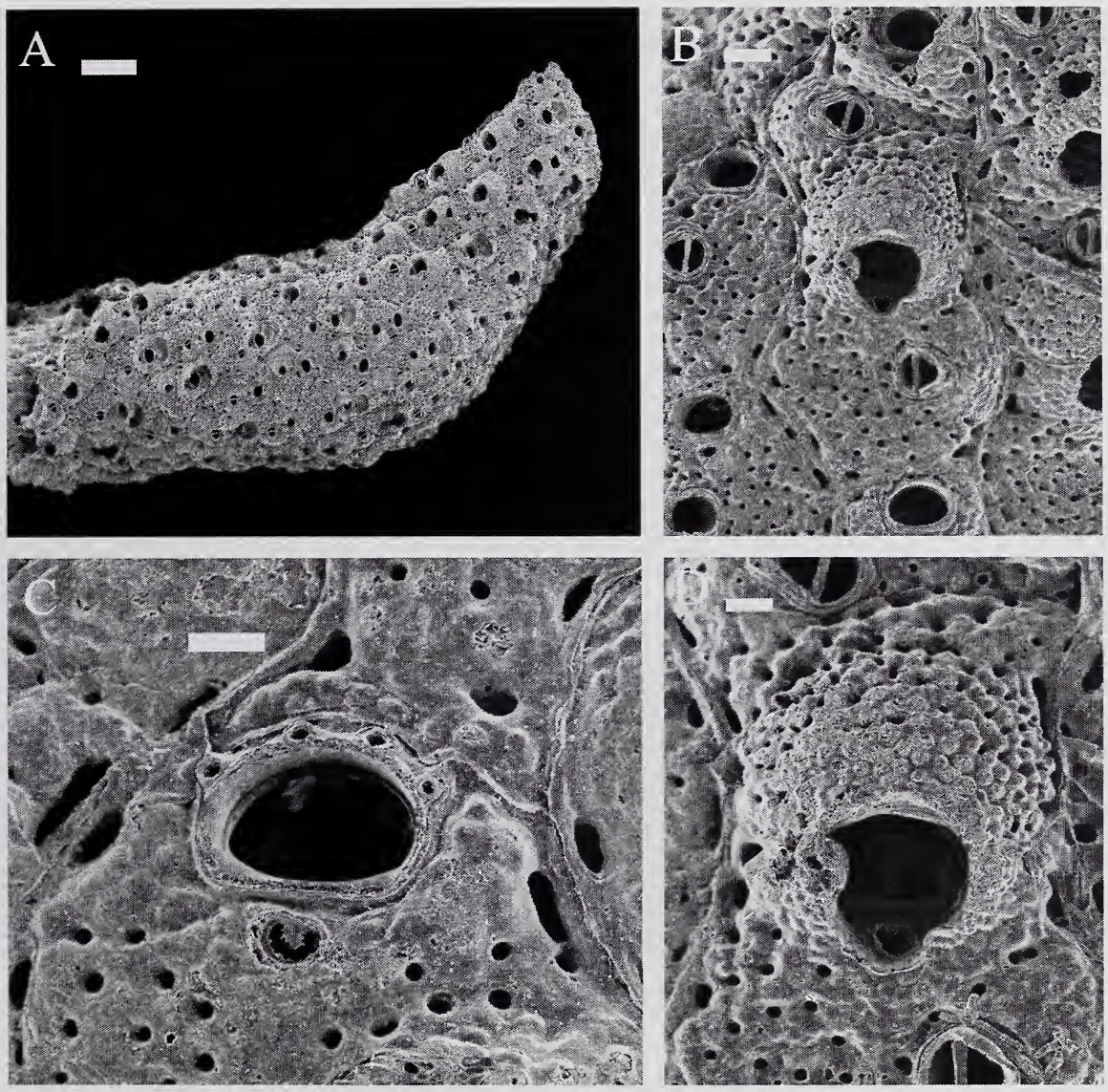

Figure 26. *Microporella protea.* Hassler Box 12. MCZ 100134. A. Colony encrusting a dead erect bryozoan. Scale bar = 500 μm. B. Group of zooids with ovicelled zooid at center. Scale bar = 100 μm. C. Close-up of orifice and ascopore. Scale bar = 50 μm. D. Close-up of ovicell, showing embedded ascopore. Scale bar = 50 μm.

Etymology. From the Latin adjective *ensifer -a -um,* sword-bearing.

Description. Colony encrusting in one or more layers (Fig. 29A). Zooids rounded-hexagonal in shape (Figs. 29C, 30C), with frontal walls only slightly convex over most of the proximal surface, but raised as a very low peristomial rim around the orifice and around the giant frontal avicularia (Figs. 29B, 30A, B). Frontal wall relatively smooth to slightly granular, imperforate except for a few small round marginal pores. Primary orifice about equal in length and width, with a semicircular anter, two sloping rounded condyles, and a large broadly U-shaped sinus (Fig. 29D). Two kinds of frontal avicularia occur: small triangular, laterally directed avicularia with complete crossbars and a raised hooked rostrum are found near the distal end of the peristome on most zooids (Figs. 29C, D); some zooids also have very large, elongate, sharply pointed avicularia with thickened crossbars, and calcified rostral shelves on swollen cystids. When such giant avicularia are present on a zooid they are placed outside the orifice rim, about level with the proximal end of the orifice, and with the point of the mandible directed proximally to slightly diagonally (e.g., Figs. 30A, B). Ovicells on the holotype specimen were not complete

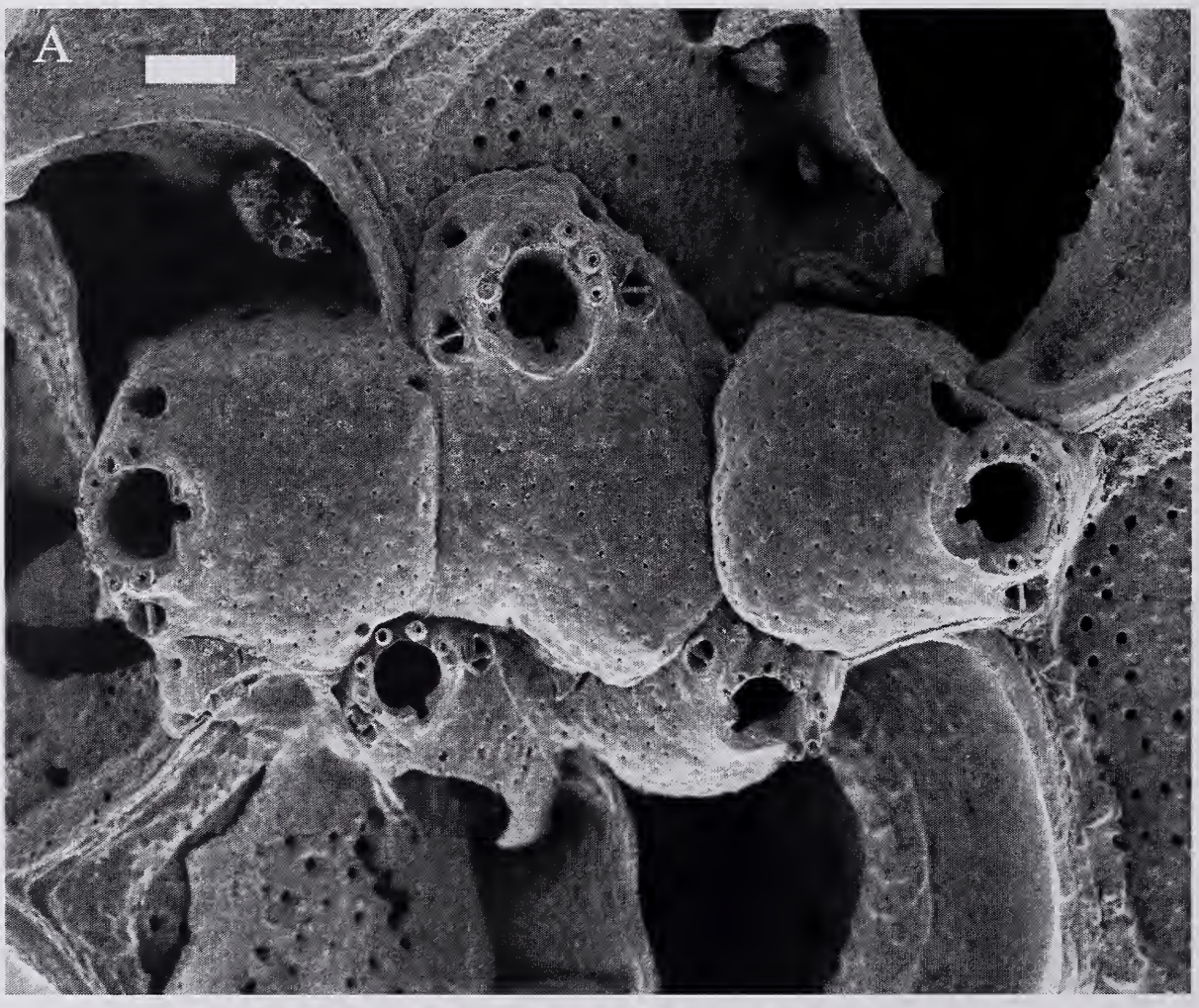

Figure 27. *Bryopesanser presanseris* (on *Steginoporella magnilabris*). Hassler Box 12. MCZ 1000135. A. Partially broken juvenile colony. Scale bar = 100 μm.

(Fig. 30A), but appeared to be developing as oecial kenozooids as in other *Buffonellaria* species (Berning and Kuklinski 2008; Ostrovsky 2008). The developing oecium rests on the proximal end of the zooid distal to the maternal zooid. When complete it consists of an outer ectooecium with a central window and an inner entooecium. The only complete ovicells were on a second and very abraded specimen, but the thickened proximal lip of the ectooecium around the semicircular opening can be seen (Figs. 30C, D).

Diagnosis. *Buffonellaria* with very enlarged, proximally directed frontal avicularia with sharply pointed tips; small, bluntly triangular oral avicularia; and ovicells with limited exposed entooecium and ectooecium thickened in a lip around the oecial opening.

	Measurements		
	Range	Mean	*N*
Lz	0.455–0.710	0.560	12
Wz	0.346–0.637	0.472	12
Lo	0.091–0.127	0.108	12
Wo	0.091–0.109	0.101	12
Lov	0.164–0.218	0.193	8
Wov	0.182–0.237	0.214	8
Lav1	0.237–0.328	0.283	11
Wav1	0.091–0.164	0.117	12
Lav2	0.055–0.055	0.055	2
Wav2	0.055–0.055	0.055	2

Notes. This species is very similar in morphology of avicularia and ovicells to *Buffonellaria ritae* Berning and Kuklinski (2008) collected off Santa Cruz, Madeira. However, zooids of the Barbados colonies are larger, the giant avicularia are larger, and also larger relative to zooid size, and have a slightly different position. Complete ovicells in good condition were not present

in the Barbados material, but those from the abraded colony definitely showed the thickened proximal rim surrounding the ovicell opening that is also found in *B. ritae* but not in most other species of the genus.

Distribution. Barbados.

Specimens Examined. MCZ 100138 Hassler Box 2, Barbados, 80 fms. December 1871. MCZ 10137. Hassler Box 15, Barbados, 100 fm. December 1871.

Genus *Buskea* Heller, 1867

Buskea minutiporosa (Canu & Bassler, 1928)

Figure 31

Cellepora tuberosa Smitt, 1873: 52, pl. IX, fig. 180. NOT *Cellepora ramulosa* f. *tuberosa* (d'Orbigny) Smitt, 1868: 31, 191 = *Turbicellipora smitti* (Kluge) 1962.

Cellepora minutiporosa Canu & Bassler, 1928b: 150, pl. 28, fig. 1.

Buskea minutiporosa Winston, 2005: 100, figs. 273–278.

Description. Colonies form bumpy irregular encrustations on calcareous substrata (Fig. 31A). Zooids are large, convex, oval to hexagonal at the growing edge, broad and irregular in shape in frontally budded areas. Frontal wall thickly calcified, smooth textured, with sparse small frontal and larger marginal pores (Figs. 31B, C). The primary orifice, clearly visible only on zooids in the primary layer, has a smoothly calcified rim, a semicircular anterior portion, and a broad, shallow, U-shaped sinus proximally (Fig. 31F). A low thick peristome surrounds it. Its opening has an irregular shape due to its rough calcification and to the common occurrence of one or two oval to bluntly pointed avicularia. The larger more pointed avicularia are embedded at an angle in the proximolateral wall. One or two smaller avicularia may be present on the peristome on one or both sides of the orifice (Figs. 31C, E). Large interzooidal avicularia with broadly spatulate mandibles and a short crossbar are scattered on colony surfaces (Fig. 31D), and small, variously directed avicularia, with rounded mandibles and crossbars, may occur also. The ovicell is large, irregularly rounded, and flattened against the colony surface. It has numerous small pores on its frontal surface and an opening separate from the maternal zooid operculum.

	Measurements		
	Range	Mean	*N*
Lz	0.510–0.655	0.564	6
Wz	0.364–0.473	0.413	6
Lo	0.127–0.146	0.132	6
Wo	0.109–0.127	0.124	6
Lov	0.218–0.237	0.223	4
Wov	0.218–0.291	0.246	4
Lav	0.109–0.164	0.124	6
Wav	0.055–0.091	0.077	6
Lav2	0.218–0.382	0.294	6
Wav2	0.146–0.255	0.188	6

Notes. This species is easily recognizable because of its large zooids and its flattened, irregular ovicells.

Distribution. Florida, Caribbean.

Specimens Examined. MCZ 100139. Hassler Box 12-4, Barbados, 100 fm. December 1871.

Genus *Cigclisula* Canu & Bassler, 1927

Cigclisula gemmea new species

Figure 32

Holotype. MCZ 100140. Hassler Box 9, Barbados, 100 fm. December 1871.

Etymology. From the Latin adjective, *gemmeus -a -um*, set with jewels.

Description. Colony erect, rigid, with bilaminar branches three or four zooids in width (Figs. 32A, B). Zooids rhombic in outline, flattened to partially erect, frontal wall calcification imperforate and granular to beaded in texture (Fig. 32C). Slitlike marginal pores and a scalloped edge mark the lateral walls of zooids. Primary orifice hoof-shaped, anter slightly more than semicircular, with two smooth bluntly triangular condyles, and a broad (diameter slightly greater than that of anter) shallowly concave poster (Fig. 32D). It lies at the base of a round, smooth-sided peristome, whose outer rim supports four or five rough-textured tubercles. Several small oval avicularia with complete crossbars and raised, toothed rostra are scattered on

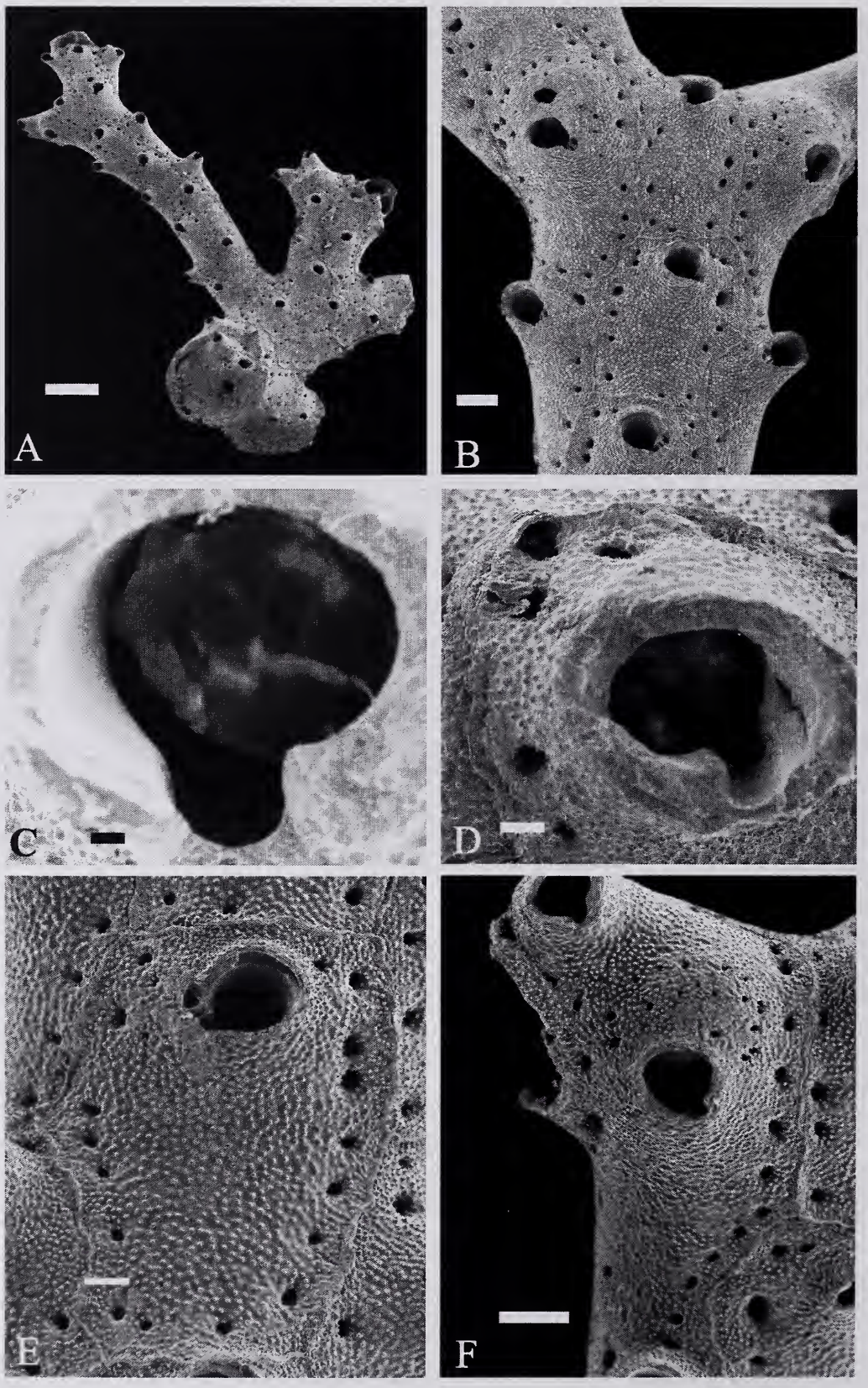

Figure 28. *Gemelliporina hastata*. Hassler Box 8. MCZ 100136. A. Colony branches. Scale bar = 1 mm. B. Portion of branch showing autozooids and one ovicelled zooid (with central pore). Scale bar = 200 μm. C. Partial view of primary orifice inside peristome. Scale bar = 10 μm. D. Zooid peristome. Scale bar = 50 μm. E. Autozooid, showing peristomial avicularium. Scale bar = 100 μm. F. Ovicelled zooid with no central pore. Scale bar = 200 μm.

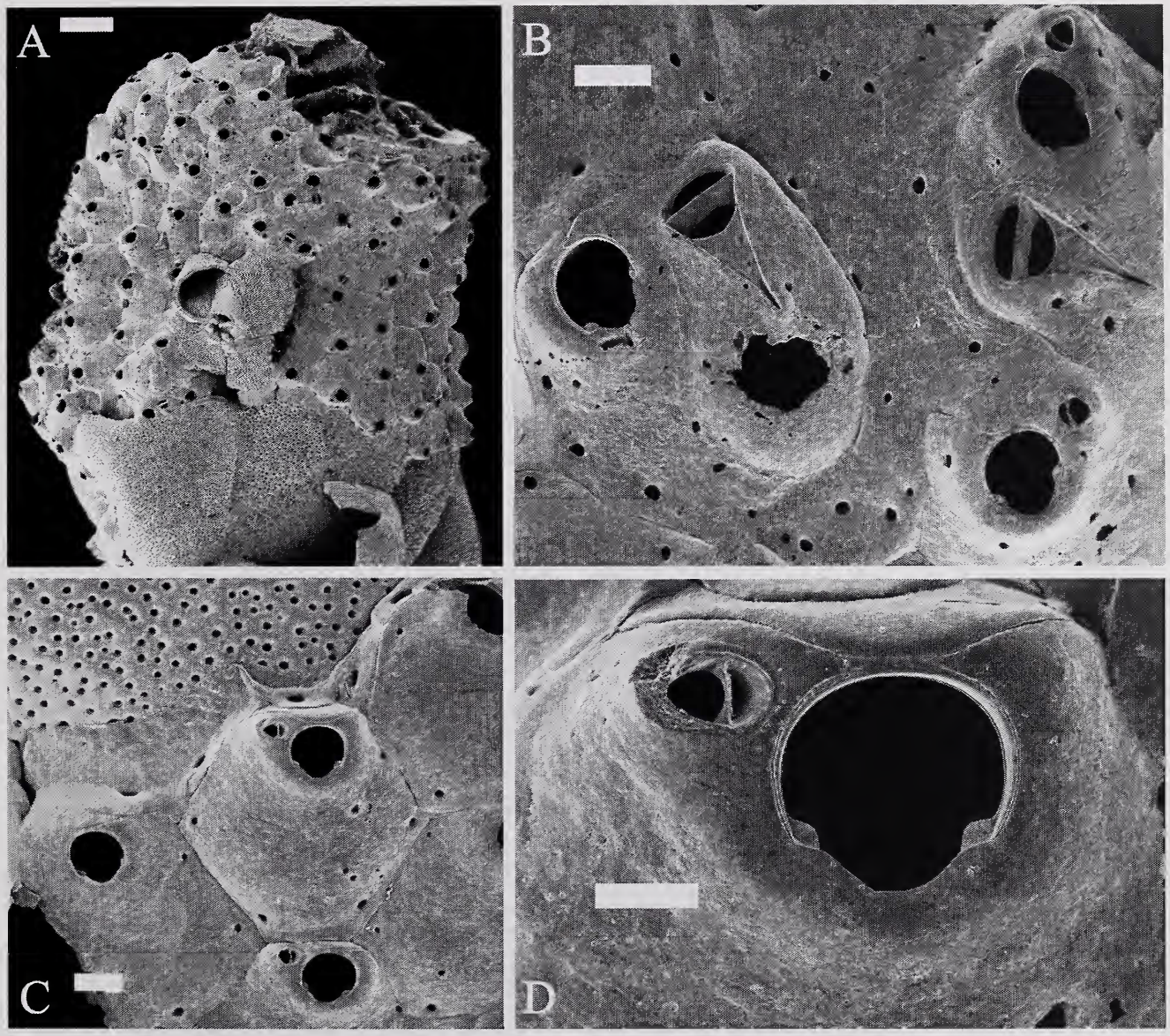

Figure 29. *Buffonellaria ensifera-1*. Hassler Box 15. MCZ 100137. Low magnification view of encrusting colony. Scale bar = 500 μm. B. Autozooids with giant frontal avicularia. Scale bar = 100 μm. C. Zooids with only small avicularia at growing edge of colony. Scale bar = 100 μm. D. Orifice and peristomial avicularium. Scale bar = 50 μm.

the frontal surface, with one of them usually adjacent to a proximally situated orificial tubercle (Fig. 32C). Large spatulate vicarious avicularia of varying sizes, also with complete crossbars and with partly calcified palates, are found on the outer sides of colonies, beyond the zooid rows. Ovicells are covered with the same granular calcification as zooids and may also bear tubercles and small oval avicularia (Fig. 32F). The ovicell has a central U- to V-shaped indentation on its proximal margin and a separate opening not connected with the orifice.

	Measurements		
	Range	Mean	*N*
Lz	0.601–0.655	0.629	6
Wz	0.510–0.637	0.564	6
Lo	0.155–0.164	0.161	6
Wo	0.127–0.137	0.130	6
Lov	0.273–0.328	0.296	4
Wov	0.255–0.419	0.323	4
Lav1	0.055–0.073	0.062	6
Wav1	0.036–0.055	0.049	6
Lav2	0.291–0.364	0.312	6
Wav2	0.127–0.182	0.161	6

Diagnosis. Erect *Cigclisula* characterized by large interzooecial avicularia on outer edges of branches, very sparse frontal pores, and an ovicell with a shallow sinus.

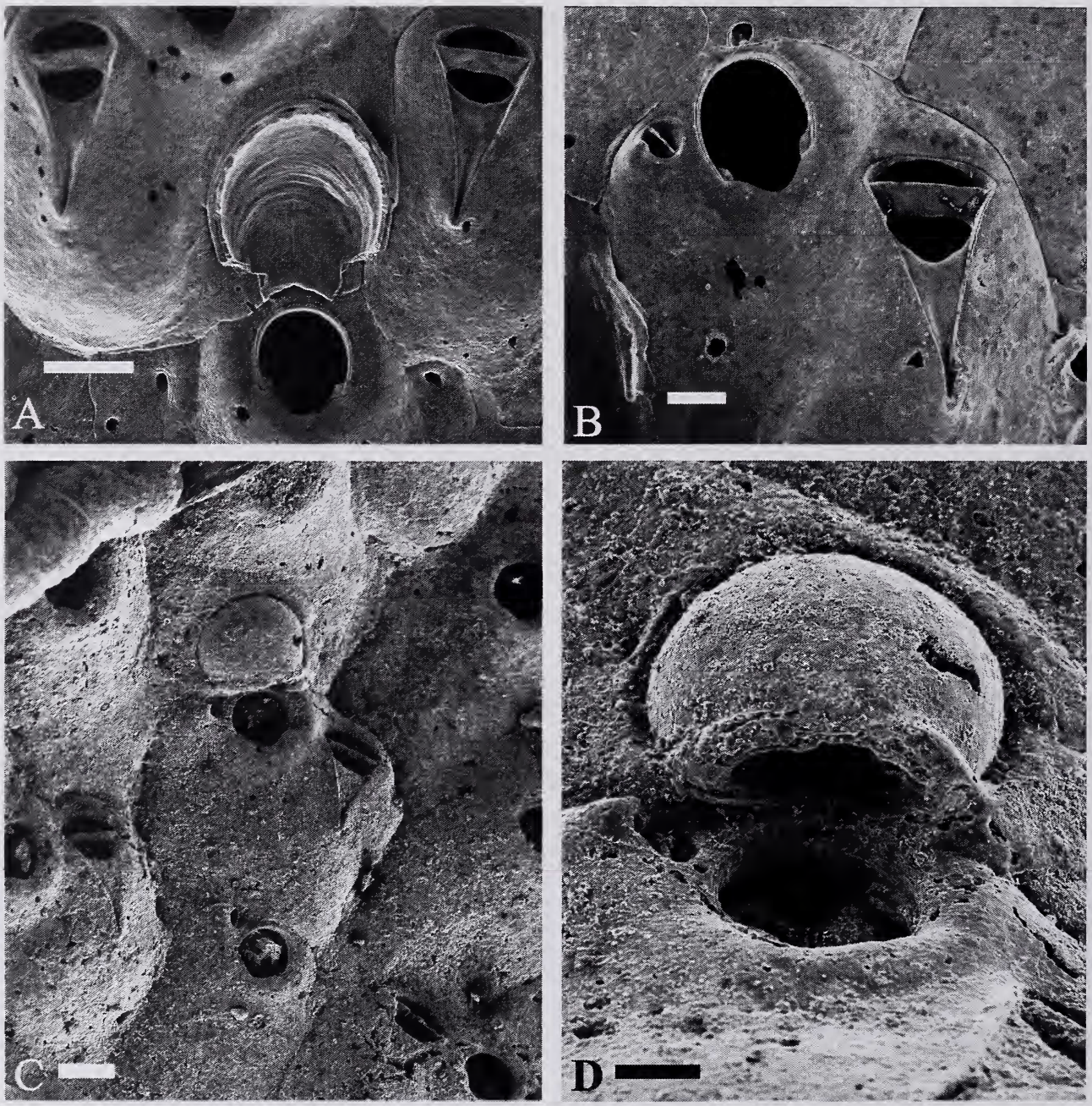

Figure 30. *Buffonellaria ensifera-2.* (A-B Hassler Box 15. MCZ 100137) A. Giant avicularia and developing ovicell. Scale bar = 100 μm. B. An autozooid with both types of avicularia. Scale bar = 50 μm. (C-D Hassler Box 2. MCZ 100138) C. Ovicelled zooid. Scale bar =100 μm. D. Close-up of ovicell. Scale bar = 50 μm.

Notes. This appears to be the first Recent record of the genus in the western Atlantic.

Canu and Bassler (1919) described *Cigclisula porosa* from the Tertiary of the Dominican Republic. All other records are Indo-Pacific.

The family position of this species and related genera such as *Trematooecia* need to be re-evaluated. They do not belong in the Stomachetosellidae, where they have often been placed. The family Stomachetosellidae was based on the genus *Stomatchetosella*, whose type species was an early Tertiary fossil, *Stomachetosella crassicollis* (Canu and Bassler, 1917). However, the Recent species that have been placed in that genus are dissimilar to the fossil type, and the family and genus should not be used for any Recent species until a revision can be done. Tilbrook (2006) placed *Trematooecia* in the family Hippoporidridae, but we have chosen to keep it in the Celleporidae.

Distribution. Barbados.

Specimens Examined. MCZ 100140. Hassler Box 9, Barbados, 100 fm. December 1871.

Genus *Trematooecia* Osburn, 1940
Trematooecia turrita (Smitt, 1873)
Figure 33

Lepralia turrita Smitt, 1873: 65, pl. XI, figs. 226–228.

Holoporella turrita. Canu & Bassler, 1923: 179, pl. 46, fig. 1; 1928b: 145, text-figs. 33c, d.

NOT *Trematooecia turrita* (Smitt) Osburn, 1914: 217; 1940: 458 (= *Trematooecia aviculifera*)

Cigclisula turrita Winston, 1982: 147, fig. 79.

Trematooecia turrita Winston, 2005: 105, figs. 291–297.

Description. Colonies forming one or more layers, encrusting to nodular (Fig. 33A). Zooids erect, their depth often greater than their frontal length or width, with irregularly polygonal borders. The primary orifice is subcircular proximally and almost circular distally with triangular distolaterally pointing condyles. It is located in the center of the frontal surface and surrounded by a peristome of four or five long, flat-tipped tubercles (Fig. 33B). Frontal calcification is thick and somewhat granular, particularly around the orifice, with small pores scattered over the surface. Small oval avicularia with serrated distal rostral margins are embedded at an angle in peristome walls between or near the ends of tubercles. Larger frontal avicularia with an enlarged, spatulate mandible and smooth rostrum also occur. Ovicells open into the peristome and are detectable only as a grid of small pores adjacent to some of the orifices.

Measurements

	Range	Mean	*N*
Lz	0.619–0.855	0.770	6
Wz	0.564–0.783	0.676	6
Lo	0.218–0.255	0.238	6
Wo	0.255–0.309	0.268	6
Lav1	0.109–0.146	0.122	5
Wav1	0.073–0.109	0.091	5
Lav2	0.346–0.346	0.346	1
Wav2	0.237–0.237	0.237	1

Notes. Nomenclature is discussed in Winston (2005), p. 107. As with many bryozoan "species" this may actually be a species group, as some morphological differences occur between specimens from different areas of the Caribbean.

Distribution. Florida, Caribbean.

Specimens Examined. MCZ 100141. Hassler Box 1-2, Barbados, 80 fm. December 1871.

Family Phidoloporidae Gabb & Horn, 1862
Genus *Rhynchozoon* Hincks, 1895
Rhynchozoon sexaspinatum new species
Figure 34

Holotype. MCZ no. 100142. Hassler Box1-1, Barbados, 80 fm. December 1871.

Etymology. From the Latin *sex*, six, and *spina -ae* f., a thorn.

Description. Colony encrusting in one or more layers (Fig. 34A). Frontal surface rough textured and chaotic because of its numerous tubercles and avicularia. Zooids oval to irregular in outline, calcification thick and imperforate with sunken, variously sized marginal pores marking their boundaries (Figs. 34B–E). Primary orifice is keyhole-shaped, with a rounded anter with beaded lateral and distal rims, very large sunken condyles, and a large rounded sinus (Fig. 34F). The distal rims of young zooids show six hollow spines (Fig. 34F). As calcification proceeds the spines become immersed, with four, two, or none visible as tuberculate peristomes develop around the primary orifice. The thick peristome has one large proximal, slightly off-centered conical tubercle with a small vertical avicularium on its inner side. On smaller raised conical projections on either side of the orifice may be tubercles with or without diagonally raised oval avicularia with crossbars and serrate rostra. Some of the frontal avicularia are enlarged, either as elongate bluntly pointed spoon shapes or broad triangular shapes (Fig. 34C) The spoon-shaped avicularia have a sunken rostral shelf and raised rims but are not raised diagonally. The broad triangular avicularia are raised at an angle on large tubercles. Ovicells are semicircular and immersed in frontal wall calcification, some with central conical

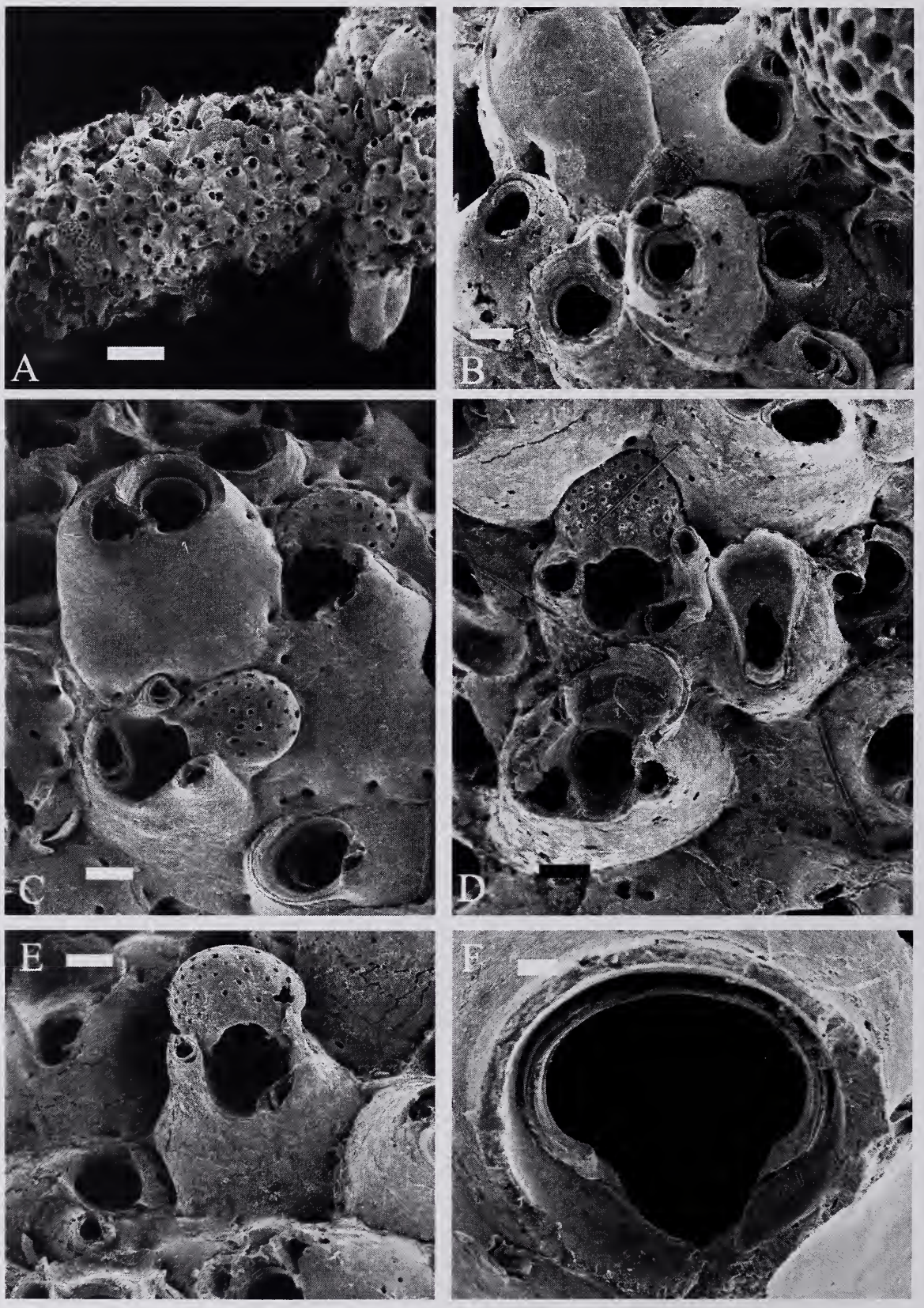

Figure 31. *Buskea minutiporosa*. Hassler Box 12-4. MCZ 100139. A. Low-magnification view of encrusting colony. Scale bar = 1 mm. B. Autozooids near edge of colony. Scale bar = 100 μm. C. Group of autozooids and ovicelled zooids with peristomial avicularia of different sizes. Scale bar = 100 μm. D. Group of zooids with a spatulate interzooecial avicularium. Scale bar = 100 μm. E. Flattened ovicell, and raised avicularia. Scale bar = 100 μm. F. Close-up of primary orifice. Scale bar = 20 μm.

tubercles topping them (Fig. 34D), their opening in the peristome above and perpendicular to the sunken zooid orifice. The vertical semicircular wall of the ovicell has a smoother texture and a curved labellum.

Diagnosis. *Rhynchozoon* with an orifice showing a very round poster and very large condyles, as well as six obvious oral spines on young zooids, rough papillate frontal walls, embedded ovicells, and three distinct types of avicularia. It may be distinguished from other Caribbean species by its orifice shape, particularly the enlarged condyles and rounded poster. *Rhynchozoon spicatum* Osburn, 1952, has an orifice with a very large shallow sinus, small tabs of condyles, and sparse beading around distal rim of anter, whereas *Rhynchozoon verruculatum* (Smitt) 1873 has a U-shaped sinus of moderate width.

	Measurements		
	Range	Mean	*N*
Lz	0.346–0.437	0.388	6
Wz	0.328–0.455	0.373	6
Lo	0.118–0.146	0.132	6
Wo	0.073–0.109	0.093	6
Lov	0.146–0.182	0.167	3
Wov	0.182–0.209	0.197	3
Lavl	0.055–0.091	0.071	6
Wavl	0.046–0.073	0.056	6
Lav2	0.237–0.528	0.337	6
Wav2	0.091–0.127	0.112	6

Distribution. Barbados.

Specimens Examined. MCZ 100142. Hassler Box 1-1, Barbados, 80 fm. December 1871.

Genus *Stephanollona* Duvergier, 1920
Stephanollona propinqua new species
Figures 35, 36

Holotype. MCZ 00143. Hassler Box 14, Barbados, 100 fm. December 1871.

Etymology. From the Latin *propinquus -a -um* =near, neighboring; similar; nearly related, closely connected.

Description. Colony encrusting in one or more layers, with a rugose surface texture due to its thick calcification and protruding avicularia (Figs. 35A–C). Zooids oval to irregularly polygonal, frontal surface covered by rough wavy ridges and bumps of calcification bounded by sunken marginal pores, junction of lateral walls a thin, barely detectable line (Fig. 35F). Orifice with six to eight hollow spines, a semicircular anter with a beaded rim, condyles with two rounded bumps, and a wide and very shallow sinus (Fig. 35E). Two types of avicularia occur. Small paired or single oval avicularia with complete crossbar, short columella, and a toothed rostrum tip occur on the frontal surface well away from the orifice (Fig. 36D). They may be positioned beside or below the orifice. There may be a second pair near the proximal edge of the zooids (e.g., Fig. 35C). These are raised diagonally from the colony surface and directed laterally to proximolaterally. Larger elongate elliptical avicularia with large mandibles and crossbars with a larger columella are scattered on the surface of the colony (Fig. 36C). Ovicells with ectooecium covered by same wavy granular calcification as zooid frontal walls, semicircular in shape, and tilted almost perpendicular to the zooid orifice. A smaller semicircular window of entooecium is visible, membranous at first, then becoming calcified (Figs. 35C, 36A, B). Ovicell opening is separate from zooid operculum.

Diagnosis. *Stephanollona* with six to eight oral spines, single or doubled pairs of oval frontal avicularia, and occasional enlarged elongate avicularia. Can be distinguished from the most similar species, *Stephanollona asper* (Canu and Bassler) 1923 by the morphology of the orifice, the presence of one to two more spines on some zooids, and by the presence of additional oval avicularia.

	Measurements		
	Range	Mean	*N*
Lz	0.437–0.655	0.531	6
Wz	0.473–0.601	0.537	6
Lo	0.118–0.137	0.127	6
Wo	0.109–0.127	0.117	6
Lov	0.200–0.237	0.226	5
Wov	0.255–0.273	0.266	5
Lav	0.237–0.364	0.291	6
Wav	0.109–0.127	0.121	6
Lav2	0.091–0.146	0.109	6
Wav2	0.073–0.109	0.088	6

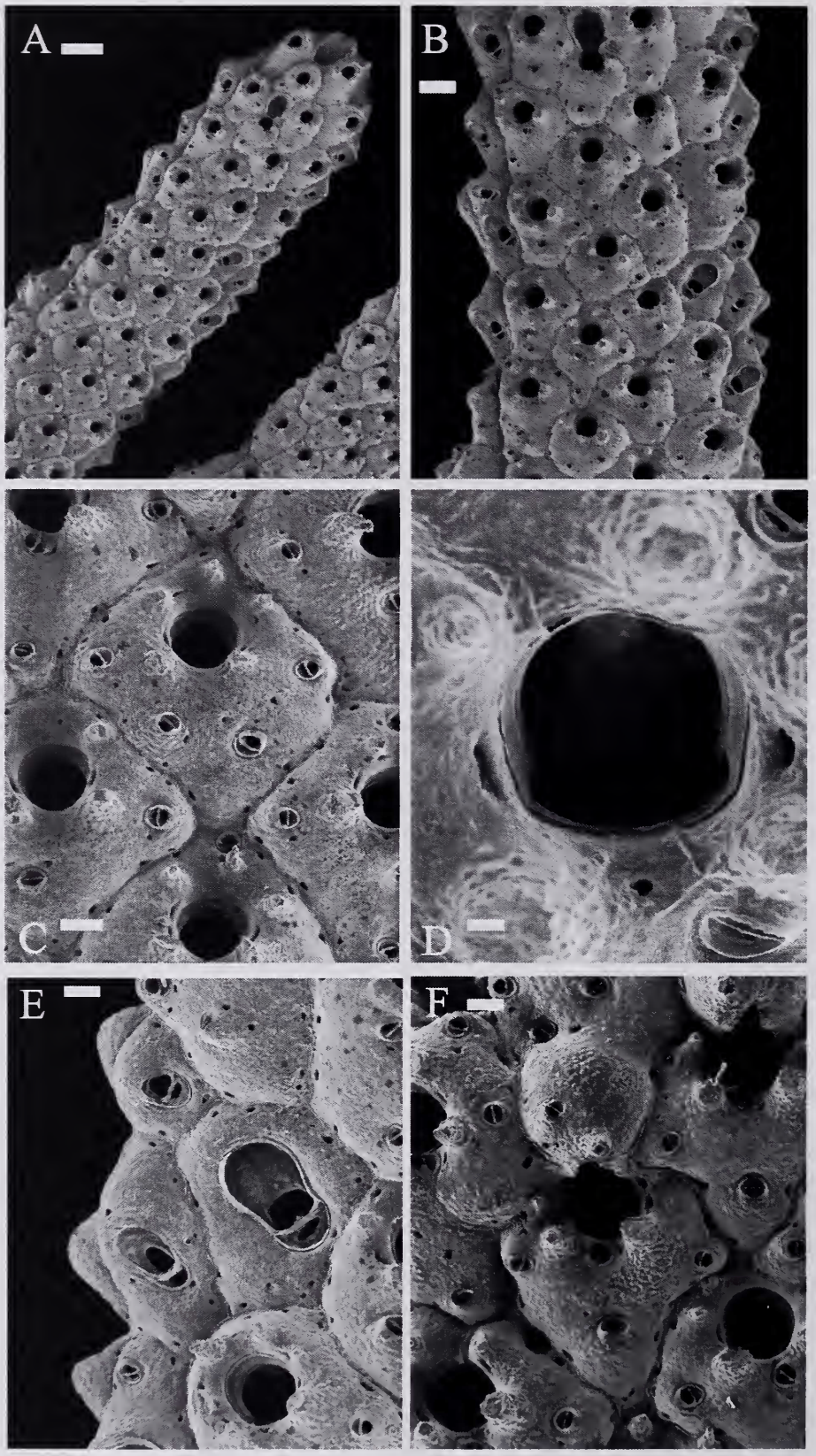

Figure 32. *Cigclisula gemmea*. Hassler Box 9. MCZ 100140. A. Low-magnification view of branches of erect colony. Scale bar = 500 μm. B. Portion of a single branch. Scale bar = 250 μm. C. Group of autozooids showing scattered avicularia. Scale bar = 100 μm. D. Close-up of primary orifice. Scale bar = 25 μm. E. Edge of branch showing interzooecial avicularia. Scale bar = 100 μm. F. Two ovicelled zooids. Scale bar = 100 μm.

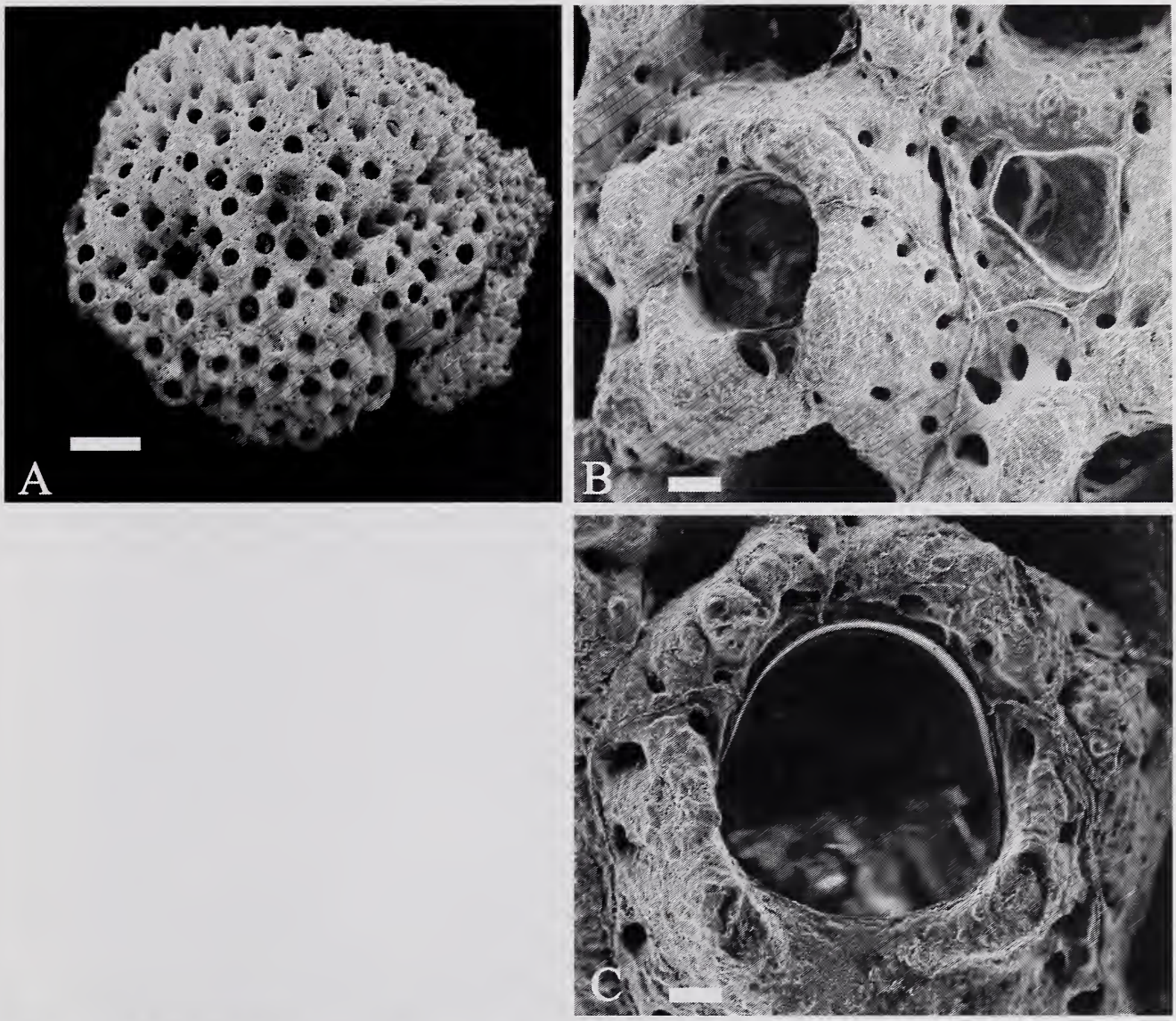

Figure 33. *Trematooecia turrita*. Box 1-2. MCZ 100141. A. Whole nodular colony. Scale bar = 1 mm. B. Zooid with peristomial avicularium and adjacent spatulate interzooecial avicularium. Scale bar = 100 μm. C. Close-up of orifice. Scale bar = 50 μm.

Notes. This appears to be a sister species to *S. asper*, a common Caribbean species. It is morphologically very similar except for the much broader and shallower sinus of the orifice, and in its more semicircular anter and double projecting condyles. As more material from the greater Caribbean is studied, a gradient in morphology between the Barbados material and *S. asper* may be found, but since orifice shape is one of the most strongly constrained characters in bryozoan species, we chose to describe it here as a separate species.

Distribution. Barbados.

Specimens Examined. MCZ 100143. Hassler Box 14, Barbados, 100 fm. December 1871.

Genus *Reteporellina* Harmer, 1933

Reteporellina directa new species

Figures 37, 38

Holotype. MCZ 100144. Hassler, Box 13. Barbados, 100 fm. December 1871.

Etymology. From the Latin *directus*, straight.

Description. Colony made up of erect, unjointed, bifurcating, nonreticulate branches (Figs. 37A, B) attached by a cemented base. Zooids irregularly rhomboidal, their frontal walls of smooth-to-wavy calcification with only a few small marginal pores visible and with raised suture lines marking zooid boundaries (Figs. 38A, C).

The primary orifice, which can be seen only on developing zooids at the growing tip of branches, has no oral spines, and is transversely elliptical, with small rounded condyles (Fig. 37D). Zooids rapidly develop long tubular peristomes with a central U-shaped sinus. The free ends of the peristome become elaborated into calcareous ruffles and projections as zooids age, but the small central sinus remains apparent. On the frontal wall of many zooids are large raised spatulate avicularia, with bifid hooked rostra (Figs. 38A, B, D). These avicularia are directed proximally, parallel to the branch axis. Ovicells smoothly calcified, flattened helmet shaped, with an elongate median fissure and a scalloped labellum (Figs. 38A, D). Abfrontal colony surface marked by raised sutures (Fig. 37C).

Diagnosis. *Reteporellina* with a transversely elliptical orifice with small rounded condyles, narrow branches, ruffled peristomes, and large proximally directed frontal avicularia with bifid rostra. No avicularia present on abfrontal surfaces. Ovicells with a long central slit and a short, scalloped labellum. It can be distinguished from other Caribbean species by its primary orifice. *Reteporellina evelinae* Marcus, 1955 has an orifice with semicircular anter and very shallow sinus, and *Reteporellina marsupiata* (Smitt) 1873 has an orifice with a keyhole-shaped sinus.

	Measurements		
	Range	Mean	*N*
Lz	0.564–0.673	0.628	6
Wz	0.200–0.309	0.258	6
Lo	0.109–0.146	0.120	6
Wo	0.127–0.191	0.173	6
Lov	0.200–0.237	0.224	6
Wov	0.164–0.200	0.187	6
Lav	0.182–0.237	0.217	6
Wav	0.127–0.155	0.138	6

Notes. This species is very similar to both *R. marsupiata* (Smitt) 1873 and *R. evelinae* Marcus, 1955, in morphology of the large frontal avicularia. However, in both species the frontal avicularia are directed at an angle, proximolaterally rather than proximally. The flared and ruffled peristome is very similar to that of *R. evelinae*.

Distribution. Barbados.

Specimens Examined. MCZ 100144. Hassler Box 13, Barbados, 100 fm. December 1871.

DISCUSSION

There are no published taxonomic accounts of the bryozoans of Barbados. Lewis (1960) described 33 scleractinian coral species on living reefs on the west side of Barbados, but, although the occurrence of bryozoans in the shallow coral reef community was mentioned, they were not discussed further, nor do they appear in the taxonomic lists in his subsequent work (Lewis, 1965) on deeper-water (50–400 m) Barbados benthic communities. From later studies of Caribbean reefs we know that bryozoans are important components of cryptic reef communities in the region (Winston, 1984, 1986; Winston and Jackson, 1984) and from taxonomic monographs on the bryozoan fauna of the Gulf of Mexico and Caribbean we know that they can also be abundant in tropical shelf and slope habitats (Canu and Bassler, 1928a,b; Osburn 1947; Rucker, 1967; Smitt, 1872, 1873).

The only published list of species of bryozoans from Barbados occurs in a paper on calcified epibionts as paleoecological tools (Martindale, 1992). Martindale states that the encrusting bryozoan fauna of Recent Barbados reefs includes at least 24 species. His survey of natural and artificial habitats from shore to 50 m found most bryozoans to occur between 10 and 30 m in cryptic (shaded) habitats. He lists 18 species, identified by bryozoan taxonomist P. L. Cook of the Natural History Museum, London, and illustrates four: *Steginoporella magnilabris*, *Parellisina latirostris*, *Puellina radiata*, and *Lichenopora* (= *Patinella*) sp.

From the Martindale species list, limited as it is, it is clear that in terms of genera, and to a large extent species, the shallow-reef bryozoan fauna of Barbados are similar to those of other shallow Caribbean reef areas

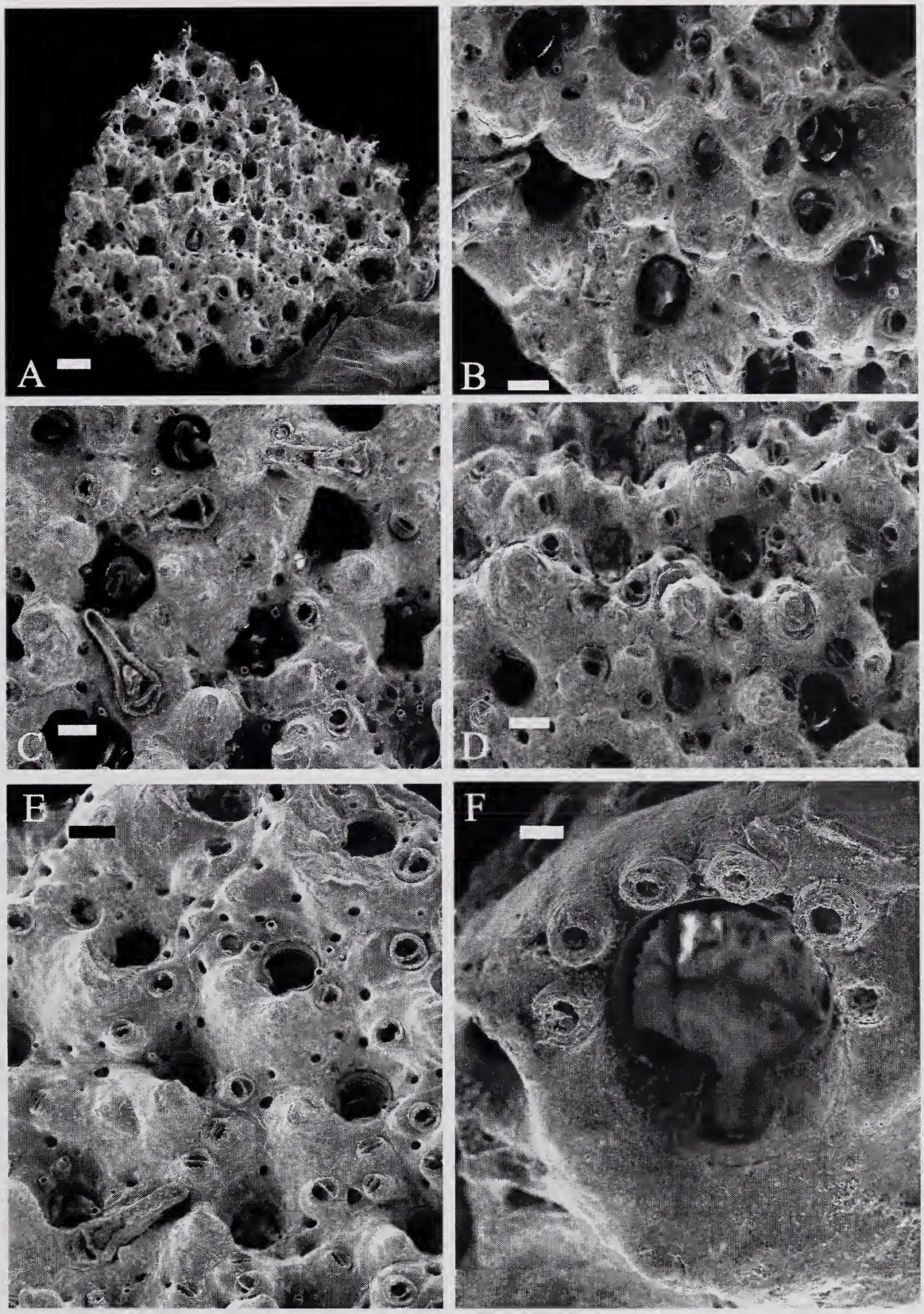

Figure 34. *Rhynchozoon sexaspinatum*. Hassler Box 1-1. MCZ 100142. A. Low-magnification view of encrusting colony fragment. Scale bar = 250 μm. B. View of frontally budded zooids, showing various types of avicularia. Ovicell on center-left zooid. Scale bar = 100 μm. C. Another region of colony with ovicelled zooids and heavy tubercles. On each zooid one conical tubercle adjacent to the orifice bears a vertically positioned avicularium on its inner side. Scale bar = 100 μm. D. Highly tuberculate and aviculiferous colony surface. Scale bar = 100 μm. E. Zooids near growing edge on which tubercles have not completely developed and primary orifice can be seen. Some oral spines still visible. Scale bar = 100 μm. F. Primary orifice showing shape of sinus, beaded distal rim, and six hollow spines. Scale bar = 25 μm.

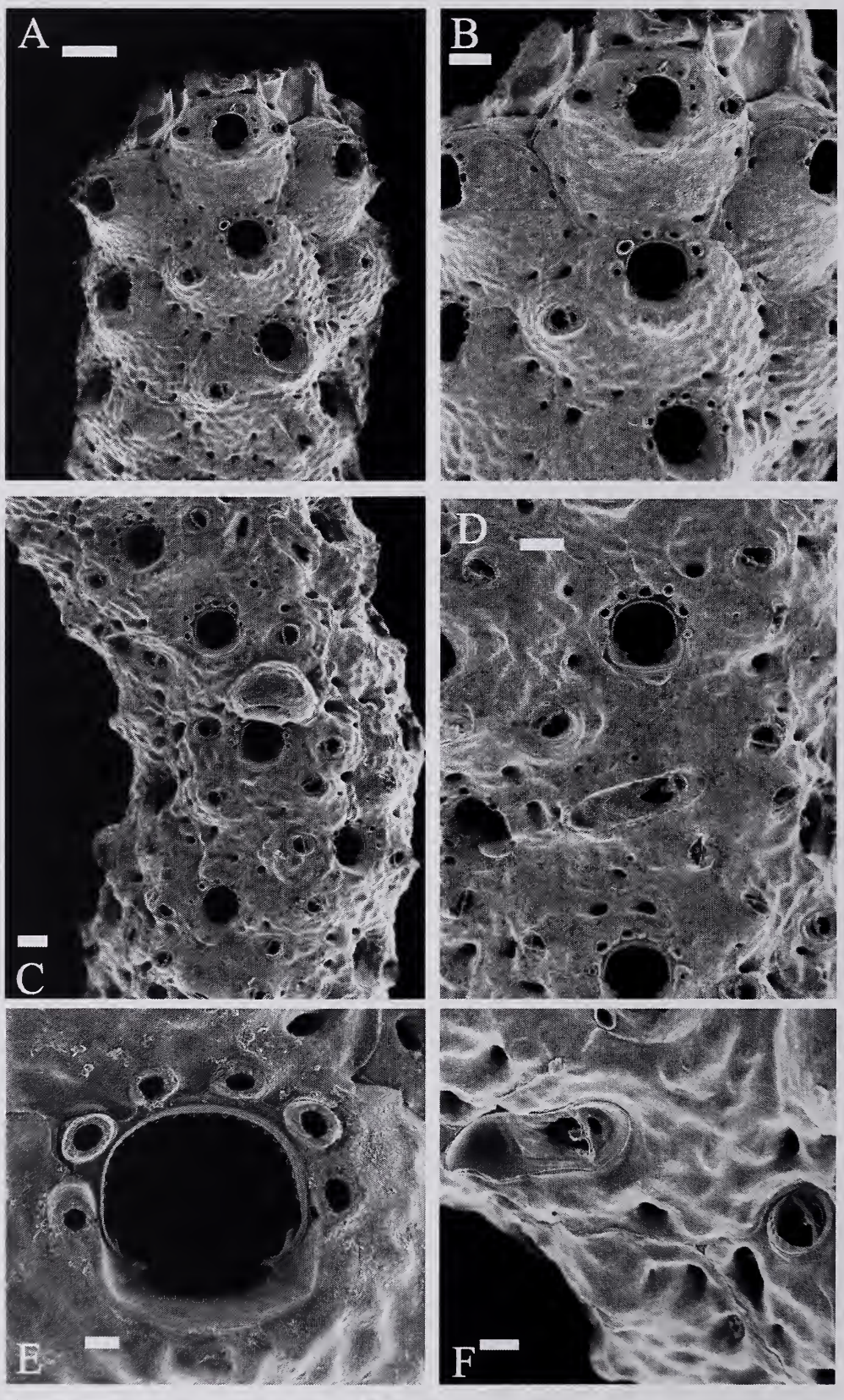

Figure 35. *Stephanollona propinqua-1.* Hassler Box 14. MCZ 100143. A. Growing tip of colony encrusting a tubular substratum. Scale bar = 200 μm. B. Zooids at growing edge, showing oral spines and early avicularian development. Scale bar = 100 μm. C. Portion of colony showing ovicelled zooid with double pairs of avicularia. Scale bar = 100 μm. D. Area of colony with many small avicularia and one larger elongate oval avicularium. Scale bar = 100 μm. E. Close-up of an orifice with six spines; note beaded rim, and double-ended condyles. Scale bar = 25 μm. F. Large avicularium with bent and pointed rostrum and small, almost round, avicularium. Scale bar = 50 μm.

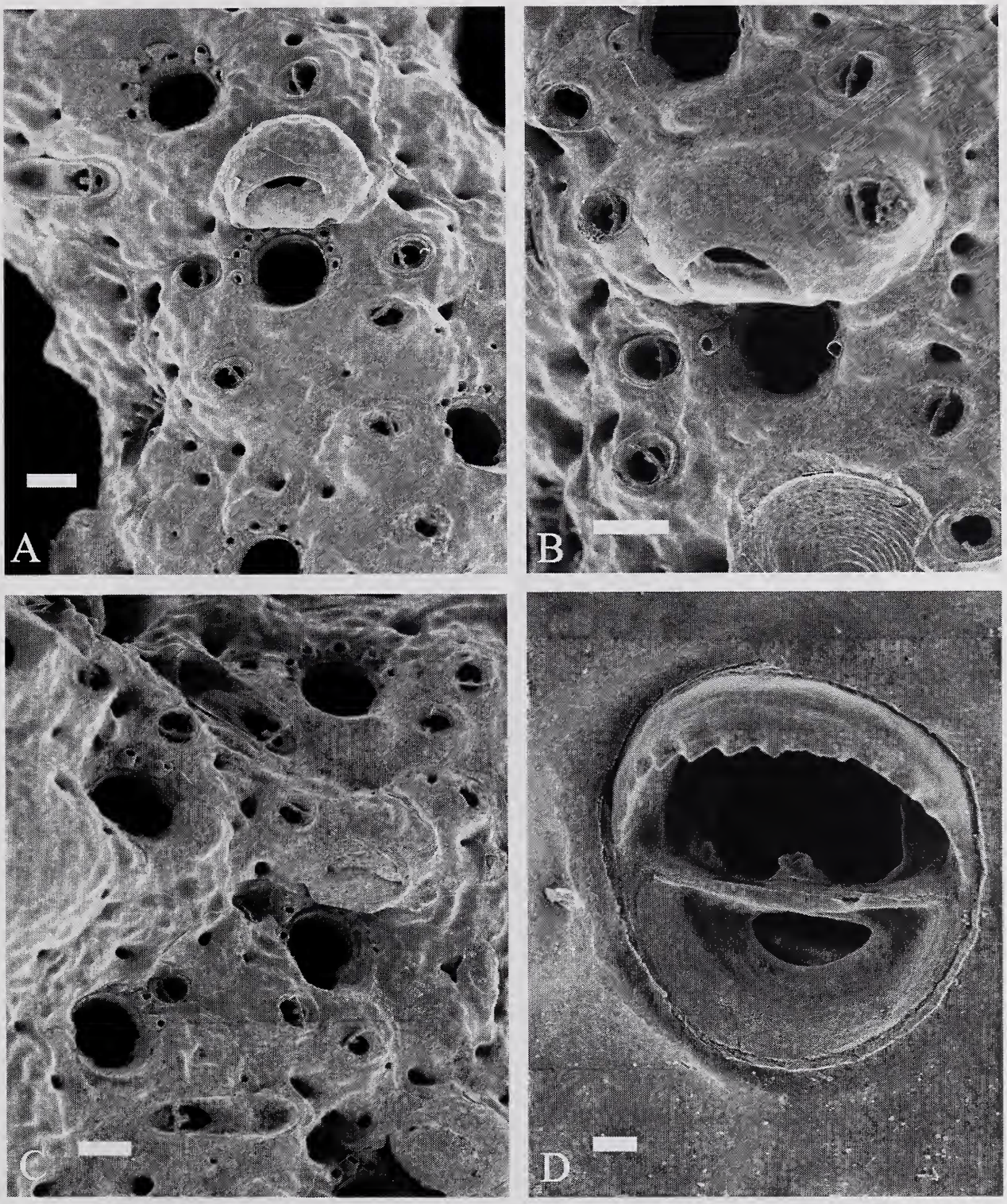

Figure 36. *Stephanollona propinqua-2.* A. Another view of ovicell. Note additional spines. Scale bar = 100 μm. B. Ovicell that has incorporated a pair of avicularia. Scale bar = 100 μm. C. Another view of colony surface and ovicells. Scale bar = 100 μm. D. Close-up of small avicularium. Note serrated rostrum and bifid projection on crossbar. Scale bar = 10 μm.

that have been studied, including Belize, Jamaica, Panama, Puerto Rico, and Costa Rica.

Macintyre et al. (1991) described a deep relict reef off the west coast of Barbados. Although their transect was north of where the two Hassler samples were collected, the topography they describe below the reef itself at 100+ m, a steep rubble and sand slope with exposed patches of epifauna-

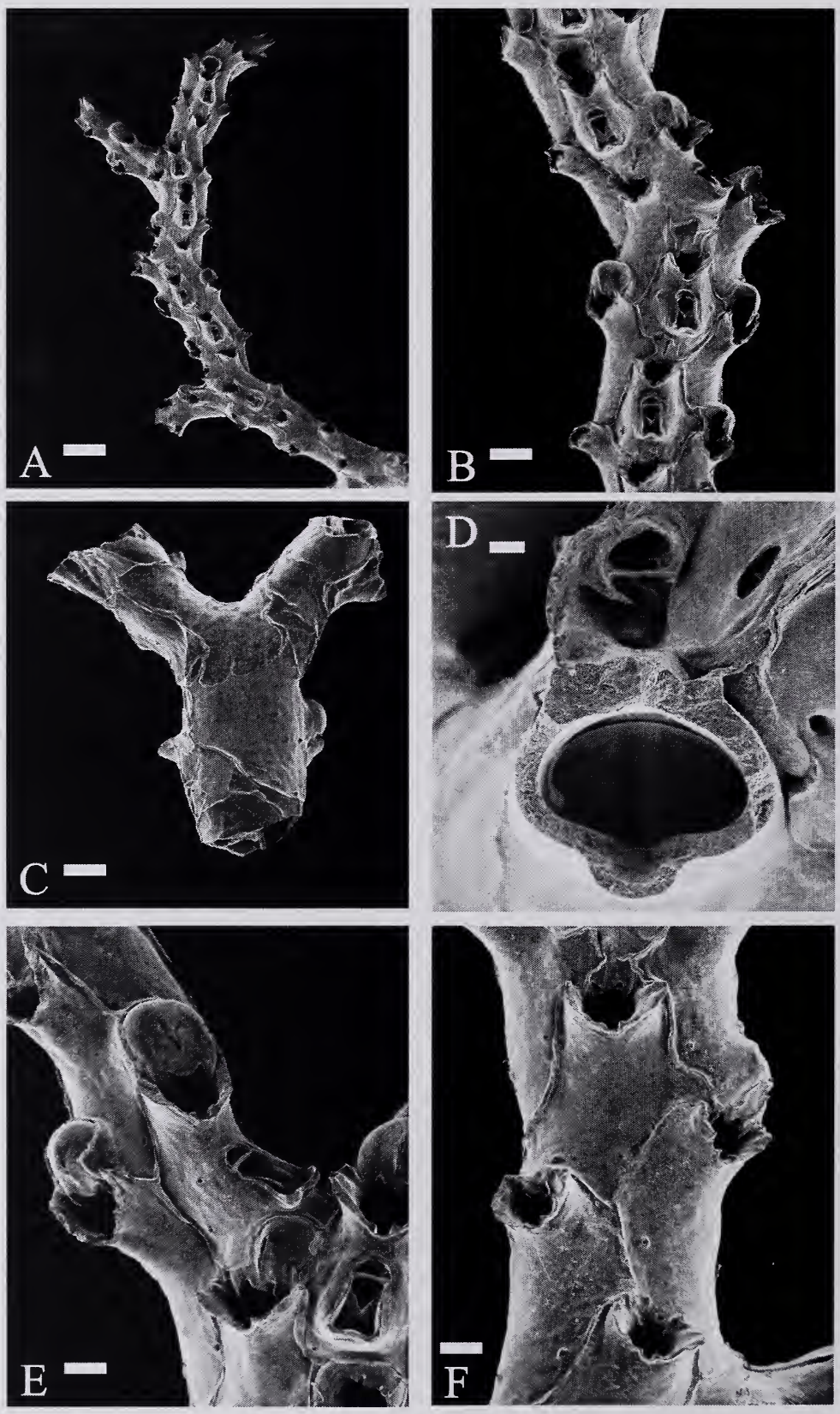

Figure 37. *Reteporellina directa-1*. Hassler Box 13. MCZ 100144. A. Colony branches. Scale bar = 500 μm. B. Close-up of branch, showing zooid morphology and position and orientation of avicularia. Scale bar = 200 μm. C. Back view of branch at a bifurcaton. Scale bar = 200 μm. D. Partial view of primary orifice. Scale bar = 20 μm. E. Ovicelled zooids at a branch bifurcation. Scale bar = 100 μm. F. Zooids without avicularia; two with ovicells. Scale bar = 100 μm.

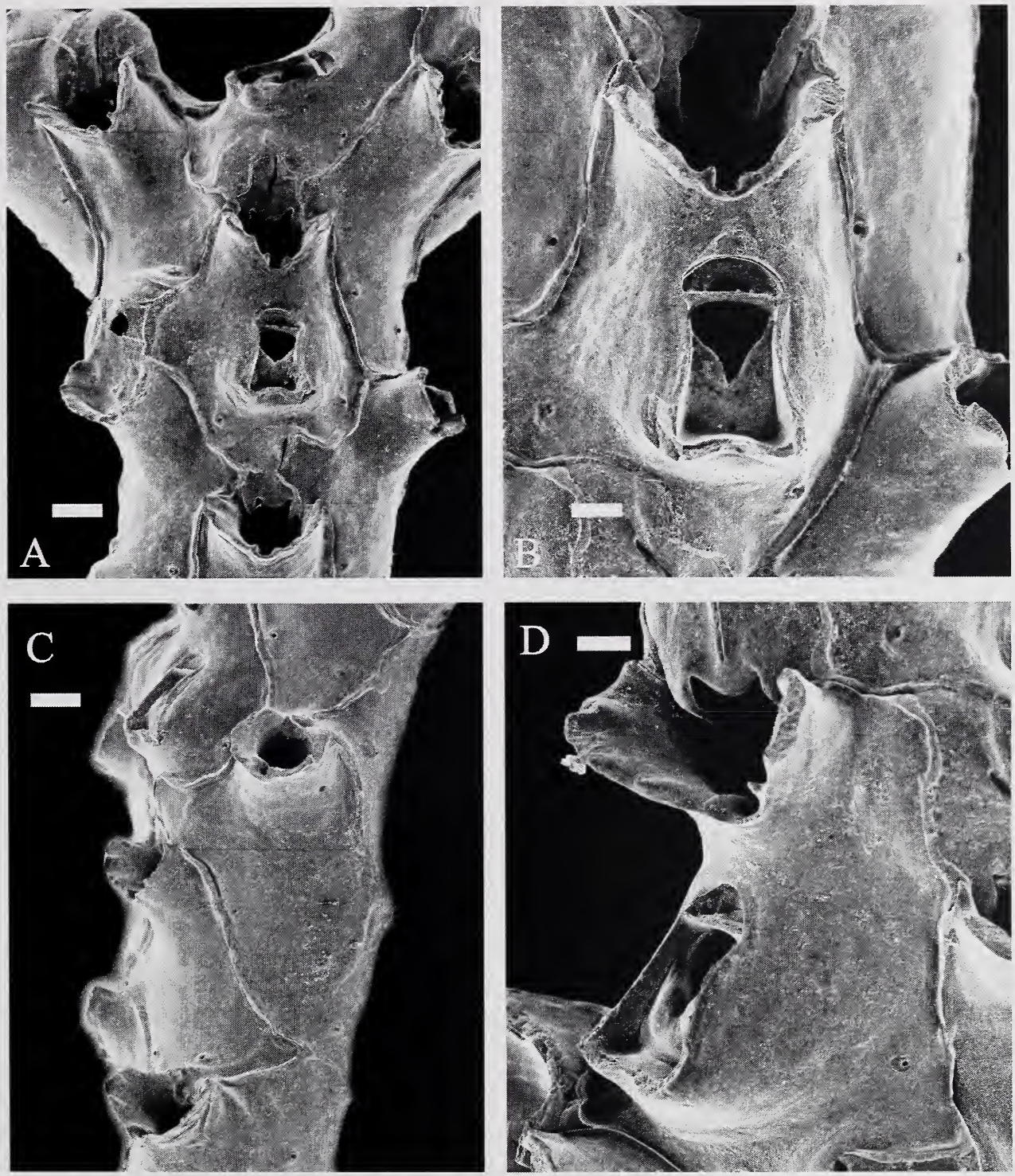

Figure 38. *Reteporellina directa-2.* A. Zooids with ovicells. Scale bar =100 μm. B. Close-up of an avicularium. Scale bar = 50 μm. C. Side view of branch segment to show ruffled peristome. Scale bar = 100 μm. D. Single ovicelled avicularium-bearing zooid in side view. Scale bar = 50 μm.

covered hardground, is consistent with the bryozoan growth forms and substrata collected by *Hassler* in 146–184 m. Macintyre's sediment sample of the 80-m ridge top of the relict reef contained irregular, heavily bored algal nodules, encrusted by calcareous epibionts including bryozoans. Similar slope algal nodules have been reported from eastern Caribbean island margins, including Barbados, by Reid and Macintyre (1988) and Stentoft (1994). Some of the species described in this paper occurred on such a

nodule. Stentoft also described the slope facies down to about 140 m as "rich in mollusc fragments and bryozoans". From 140 to 215 m he listed sediments as "rich in foraminifera, molluscs and crustaceans", with no mention of bryozoans, yet the *Hassler* sample from 100 fm (184 m) contained 16 species, almost as many as found at the 146 m site (19).

The most striking thing about the *Hassler* Barbados bryozoan collection is the large number of new species relative to the total number of species found at the two stations sampled. Of 26 cheilostome species found, 16 are new, and one represents a new genus, *Barbadiopsis*. Even subtracting the two new species that had been previously recorded in the region, but misnamed (*Exochella tropica* and *Metroperiella agassizi*), more than 50% of the cheilostome species are new. In part, this may be due to the lack of sampling of deeper-water habitats in the eastern Caribbean. The taxonomic reports of bryozoans of the region are almost all from shallow reef or mangrove habitats. Osburn (1927) recorded 23 bryozoans collected from two shallow inland bays in Curaçao. Leaving out the "species" we now recognize as species groups and for which species determination would require study of his specimens, only two species were in common with *Hassler*'s Barbados samples: *Bryopesanser pesanseris* and *Trematooecia turrita*. Fransen (1986) described 25 species from Curaçao, mostly also from shallow bays. Not surprisingly, there was no overlap with the Barbados material.

Studies in which deeper water sampling did occur also show little overlap. Osburn (1947) listed 107 species taken during the Allan Hancock Atlantic Expedition, 1939, at coastal and continental shelf stations (deepest 130 m) from Panama eastward to Colombia and Venezuela. Only four species from this collection were also found in the Barbados collection: *Proboscina robusta*, *Steginoporella magnilabris*, *Lagenipora verrucosa*, and *Bryopesanser pesanseris*. Flórez-Romero et al. (2007) reported 62 species of cheilostome bryozoans collected by trawling from soft bottoms of the Colombian Caribbean at depths from 20 to 500 m. Four species were also found in Barbados: *Steginoporella magnilabris*, *Trematooecia turrita*, *Bryopesanser pesanseris*, and *Microporella protea*.

Rucker (1967) listed 42 cheilostome species from cores taken on transects across the mostly soft bottom sediments of Venezuela–British Guiana continental shelf, of which only three species were also found in Barbados: *Antropora typica*, *Steginoporella magnilabris*, and *Bryopesanser pesanseris*.

The lack of similarity in the bryozoan fauna may be related to the isolated position of Barbados, more than 145 km east of the other Lesser Antilles Islands and subject to different recruitment-affecting current patterns than other areas studied. Richardson and Cowen (2004) studied the diversity of leptocephalus fish larvae around Barbados with sampling extending to 140-m depth. They found the source of recruits to be linked to oceanographic conditions. At times when North Brazil Current Rings (anticyclonic rings formed by the collision of the North Brazil Current and the North Equatorial Countercurrent and extending to 200-m depth) reached the waters around Barbados, the abundance of locally spawned larvae was reduced and an increase in species, probably carried from the Guyanas region of the South American coast (between the Orinoco and Amazon Rivers), increased. At other times recruitment from local spawning events predominated.

Other groups of organisms are also more speciose in deep water in the Lesser Antilles area. According to Macintyre et al. (1991) the deeper-water (80 m) Barbados algal fauna may be diverse, and both stylasterines and ahermatypic corals show their greatest Caribbean diversity in the Lesser Antilles and at depths below 100 m. This diversity in deeper water might also be explained by the effects of the Holocene transgression. Beginning some time after 9,000 years ago, increasing sea levels drowned once-shallow coral reefs in the Caribbean and off the

Florida east coast (Macintyre et al., 1991). The flooding, bringing with it cooler water, turbidity, and higher nutrient levels, could also have isolated once-reef-associated species in deeper water where the survivors, now removed from other reef habitats, diverged from their relatives.

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